THE

YEAR-BOOK OF FACTS

IN

Science and Art:

EXHIBITING

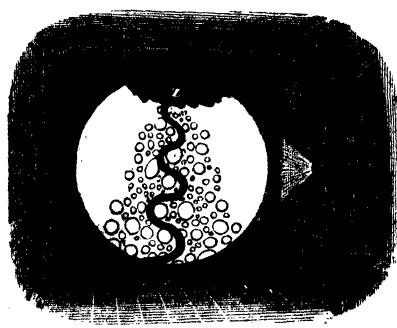
THE MOST IMPORTANT DISCOVERIES AND IMPROVEMENTS OF THE PAST YEAR,

IN MECHANICS AND THE USEFUL ARTS; NATURAL PHILOSOPHY; ELECTRICITY; CHEMISTRY; ZOOLOGY AND BOTANY; GEOLOGY AND GEOGRAPHY; METEOROLOGY AND ASTRONOMY.

Illustrated with Engravings.

BY THE EDITOR OF "THE ARCANA OF SCIENCE."

"Every Discovery opens a field for the investigation of Facts."
SIR HUMPHRY DAVY



Decomposition of Water, under the Gas Microscope.

LONDON:
TILT AND BOGUE, FLEET STREET.
MDCCCXLI.

Wilson and Ogilvy, 57, Skinner Street, Snowhill, London

PREFACE.

In presenting to the public the Third *Year-Book of Facts*, it may be as well to premise that it contains no fewer than Five Hundred Abstracts of Inventions and Improvements in Science and Art—the labours of the past year. This numerical attraction has not, however, been insured at the risk of rendering the several Articles incomplete by the omission of leading details, or by their abridgment overmuch; although, results rather than means have been the aim of the *Year-Book* from its commencement. The whole, the Reader is assured, has been condensed with equal regard to conciseness and utility, as well as popular interest; and, in cases where the details are too numerous for quotation, distinct reference has been made to the source whence such Abstracts have been derived. It is not too much, therefore, to assume the present volume to be, as one of its precursors has been characterized—"a laborious production of patient industry;" the majority of the Facts having been materially abridged, concentrated, or re-written. With this plain statement, the Editor is content to leave the present *Year-Book* to the same impartial opinion that has tested its predecessors.

Meanwhile, if requested to point to the more striking contents of this volume, as denoting the active scientific spirit of the year 1840, the Editor would refer to the very numerous improvements in Steam Navigation, and in Civil Engineering,

generally; the paramount importance of the Progress of Terrestrial Magnetism; the first-rate interest of the Electrical Researches, with the pictorial attractiveness of the Electrotype process; the number and variety of the New Facts in Chemical Science, not omitting the Experiments of the Year, on "Poisoning by Arsenic," and the advances to perfection made with the Daguerréotype; the Novelties in Zoology and Botany; "the Progress of Geology," a section rife with encouragement for the lover of Science; the Astronomical and Meteorological Phenomena of a year unusually changeful; and the consummation of the North-west Passage: all which subjects will be found to occupy prominent positions in the ensuing pages.

I. T.

Gray's Inn, January, 1841.

*** Although the publication of this *Year-Book* takes place some weeks earlier than in previous years, the information contained in the following pages has been uniformly brought down to the close of 1840.

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ENGRAVINGS.

THE

YEAR-BOOK OF FACTS.

Mechanical and Useful Arts.

SCIENTIFIC EXHIBITIONS.

(See Frontispiece and Vignette.)

To re-quote the President's Address to the British Association, in 1840, "the amusements of life have taken a scientific colour;" and our several Metropolitan Exhibitions partake more or less of this attractive character.

During the past year, the *Polytechnic Institution*, (described in the *Year-book of Facts*, 1839, p. 65,) has been considerably enlarged; and several new rooms, with a great number of models, &c., have been added. We have, therefore, selected from this popular resort the frontispiece illustration of the present volume; which represents the principal Saloon of the Institution and its Galleries, (not omitting the Diving-Bell, described in the *Year-book*, 1840, p. 38,) from a drawing made expressly for this work.

To the *Gallery of Practical Science* in Adelaide Street, Strand, several important accessions of novelty have also been made. Mr. E. M. Clarke has been appointed Optician, &c. to the establishment, and his superintendence of the Philosophical Apparatus, as the Oxy-hydrogen Microscope, the Pyr-eidotrope, Fire-cloud, &c.

The Vignette represents one of the great attractions at both the above Institutions, viz., Sturgeon's interesting experiment of the Decomposition of Water by a Voltaic circle, arising from the action of Platina on amalgamated Zinc, shown under the Oxy-hydrogen Microscope, in the following manner:

A glass trough, containing dilute sulphuric acid, is introduced horizontally, as a slider into the microscope. A piece of amalgamated zinc is then thrust into the liquid, but no action takes place. A piece of platina wire is then thrust into the liquid; but if kept apart from the amalgamated zinc, still no action is apparent. The moment, however, that the wire is brought into contact with the amalgamated lump, pearly bubbles of gas are seen to form on all parts of the platina. Here Z is the lump of amalgamated zinc, seen in dark profile on the illuminated disk, and the equally dark serpentine line in contact with it is the platina wire. It will be observed, that notwithstanding the platina wire is covered with gas, not a single bubble is given off the amalgam. This Engraving has been reduced from Mr. Clarke's *Directions for using Philosophical Apparatus*: The Gas Microscope—published during the past year, and, unquestionably, the most complete account of this powerful Instrument that has yet been submitted to the public. The manipulatory instructions are very lucidly given.*

* A new Edition of Mr. Palmer's Catalogue of Apparatus has also appeared, with 300 Engravings; including Mr. Spencer's Electrotype Apparatus, and Mr. Smee's new Galvanic Battery.

THE THAMES TUNNEL.

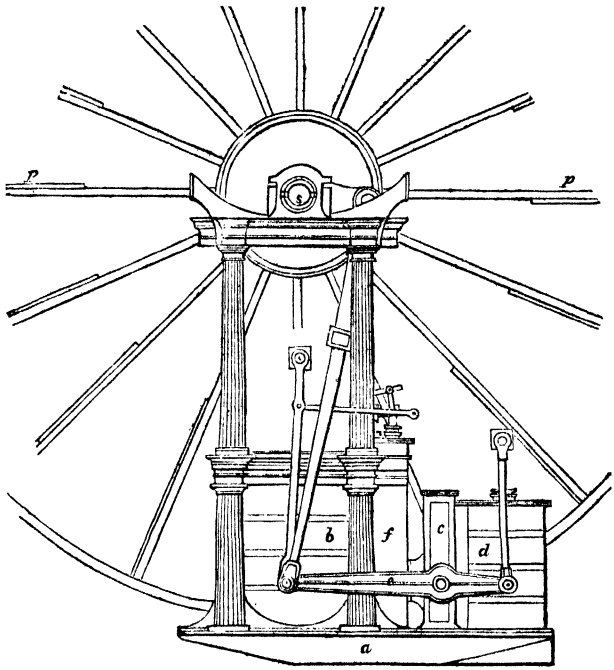
THE Tunnel has been completed to the breadth of the river, (1,140 feet,) the advance having been 60 feet during the past year. Up to June 23d, according to a statement made by Mr. Brunel to the Institution of Civil Engineers, the works had not much progressed since March, 1840, the date of the plan in the *Year-book* last published. Mr. Brunel then stated the progress of the Tunnel in the previous year to have been, within one foot, equal to that made in the three preceding years. During these periods, collectively, the extent of the Tunnel excavated was 250 feet 6 inches; whilst, during the above year, the excavation had been 249 feet 6 inches, and this advance was made in spite of the difficulties caused by the frequent depressions of the bed of the river. These were so extensive, that in the course of 28 lineal feet of Tunnel, the quantity of ground thrown upon the bed of the river, to make up for the displacement, in the deepest part of the stream, was *ten times* that of the excavation, although the space of the excavation itself is completely replaced by the brick structure. On one occasion, the ground subsided, in a few minutes, to the extent of 13 feet in depth over an area of 30 feet in diameter, without causing any increased influx of water to the work of the Tunnel. The results now recorded confirm Mr. Brunel in his opinion of the efficiency of his original plan, which was "to press equally against the ground all over the area of the face, whatever may be the nature of the ground through which the excavation is being carried." The sides and top are naturally protected; but the face depends wholly for support upon the poling-boards and screws. The displacement of one board by the pressure of the ground might be attended with disastrous consequences; no deviation, therefore, from the safe plan should be permitted. Mr. Brunel added, that a full and complete record of all the occurrences during the progress of the Tunnel has been kept; so as to supply information to enable others to avert many of the difficulties encountered by Mr. Brunel, in this bold yet successful undertaking.

IMPROVEMENTS IN STEAM-VESSEL MACHINERY, BY GEORGE RENNIE, ESQ. C. E.

AT the *soirée* of the President of the Civil Engineers' Institution, on May 27th, a very beautiful model was exhibited of a Marine Steam Engine on a plan of construction and arrangement proposed by George Rennie, Esq., which presents several points of novelty well deserving the consideration of marine steam-engine builders.

The engraving exhibits an inner side view of this model. The engine represented is meant to be of 280-horse power, and the reader is to suppose that there is, as usual, a companion to it of the same power, though for clearness' sake it is omitted in the engraving. Instead of *two* engines, however, in such a case, Mr. Rennie would prefer that there should be *four* employed, of 140-horse power each, and this on account of the greater facility which such a division would give to his system of equal distribution of weight, to be presently explained.

A is the platform (of about one-half the usual weight); B, the cylinder 84 inches diameter; C, the condenser; D, the air-pump; E, side lever; F, side valves; P, paddle-wheel; S, main shaft.



The cylinder, the air-pump, the condenser, and the slide valve cases, all rest on the platform as usual; but instead of the motion being taken, as at present, from the opposite ends of the side levers, the motion is communicated from the piston rod to the crank, through the medium of the side rod, and the same end of the lever, while the weights of these rods are counterbalanced by the air-pump. The pillow-blocks and entablature rest immediately upon two ranges of columns, which rest again on the platform at the base, and embrace the cylinders by entablature and architrave frames. The upper parts of the pillow-block entablatures are made fast by dovetails let into cast-iron plates bolted to the transome beams which run across the vessel; by which means any settlement, or sinking in the frame-work of the engine, is effectually counteracted. An arrangement similar to this has been followed in several of those splendid steam-vessels which have recently been sent across the Atlantic, and to other distant places; but

Mr. Rennie proposes, with a view of distributing more equally the immense weight of the engines throughout the vessel, and of counteracting the shocks of the waves, to adopt a more extensive system of bracing, both by oblique and suspending riders, than has hitherto been done. The principle on which he proceeds is the obviously sound one of opposing to each and every portion of dead weight, some counteracting weight or force of equal amount; so that by distributing the engine power and weight over every part of the vessel affected by the engine, all injurious strain on any particular part may be avoided. He would, on the one hand, make the vessel proof against every external force which might tend to crush her inwardly, and equally proof on the other against every internal force which might tend to thrust her asunder. Mr. Rennie thinks that this equilibrium, or mutual balance of forces both outwardly and inwardly, is not sufficiently attended to at present. Indeed, when we consider that the weight of some of the large engines, including the boilers, is not less than from 400 to 900 tons; that this weight often occupies one-fourth or one-third of the midship space of a vessel; that the tendency to bring up or weigh down the stem and stern, or break the body, is always varying on account of the greater or less weight of the cargo, and the uncertain action of the waves—it does seem a wonder that these immense steam-vessels should perform so well as they do. True they do their duty, but it is at an expenditure in wear and tear, which cannot be otherwise than enormous.

Mr. Rennie calculates that the saving to be effected by his new plan of arrangement will be as follows :—

	Old plan.		New.		Saving.
	tons.				
Weight of engines	212	..	122	..	90
	sq. feet.				
Area..	868	..	568	..	300

In the boilers, Mr. Rennie proposes no alteration.

The paddle-wheel in the model we have been describing, is on the trapezoidal plan, for which Mr. Rennie has recently obtained a patent. The results of the experiments made with this wheel appear to establish undeniably, a considerable gain in velocity, in facility of working, and in freedom from vibration and noise. The novelty of construction consists simply in the substitution of floats of a trapezoidal form, for the rectangular ones commonly employed, and in the greater narrowness and lightness which can be thus given to the wheel. Mr. Rennie calculates on saving the width of a paddle-wheel in two. The floats may be of any of the trapezoidal forms resulting from the bisection of a cone; but Mr. Rennie prefers the form in which the diagonals are in the proportion to one another of 1 to 1½, and the greatest of these diagonals is vertical—*Mechanics' Magazine*, No. 879; *abridged*.

THAMES STEAM NAVIGATION.

The Thames, between London Bridge and Chelsea, is now provided with upwards of 25 steam-boat piers. The river has now become the

most important public highway in this kingdom, and perhaps in Europe. The number of passengers always afloat is enormous; and it sometimes happens there are 10,000 persons going up and down the river at one time in steam-vessels, including those proceeding to and from the Continent. Capital to the amount of five millions is employed in steam navigation, and 150 steam-vessels are constantly engaged on the river.—*Observer*, May 3rd.

NEW MODE OF PROPELLING STEAM-BOATS.

An ingenious mechanic, residing at Grahamstone, has been, for a long period, engaged in constructing a small vessel, to be propelled by means of pressure pumps—the application of a principle quite new to the masters of this science. The boat on being launched into the Forth and Clyde canal, at Bainsford-bridge, proceeded beautifully along the reach at a rate of not less than 15 miles per hour, conducted alone by the inventor, who worked the pumps.—*Times*.

CORNISH STEAM-ENGINES.

Mr. Wicksteed, engineer of the East-London Water-works, at Old Ford, near Bow, had addressed a letter to the *Mining Journal*, containing some very important details of the Duty performed by Cornish Steam-engines; comprising the diameter of the cylinder, and performances of duty of eight engines—viz., Fowey Consols—Austin's; Wheal Vor—Borlase's;—Wheal Darlington; Charlestown United Mines, ditto. Stamping-engine; the Cornish engine at the East London Water-works, designed and erected by Mr. W. West; and a Bolton and Watt engine, on the same works, boiler and cylinder, &c., clothed with Borodaile and Whiting's patent felt, and pumps fitted with Harvey and West's patent valves: the duty reported as performed during a six hours' trial, the average duty performed during twelve months' trial, the average of coals used per hour per horse power, and other particulars of the variation in the duty performed, &c. Mr. Wicksteed very properly says: "An inspection of the Table will shew how little reliance is to be placed on short trials, for in the same engine the variation in duty during twelve months' regular work is very great; and taking the Wheal Vor stamping engine, the duty done during the short trial was less than the average reported duty for twelve months." This table establishes the fact contended for. viz., the great superiority of the Cornish engines, the saving of fuel by their employment. and the admirable manner in which they perform their duty. The Cornish engine, which has been in use at the East-London Water-works at Old Ford, was introduced by Mr. Wicksteed, and the Company have experienced from it a saving of about £2,400 a year in coals.

The following extracts from a printed paper by Mr. Wicksteed, published by Mr. Weale, High Holborn, on the *Effective Power of the Cornish Steam Engine*, will give a further explanation of this subject:—

"The principle of expansion is not new; it is the extent to which it has been carried, of late years, by the successful adoption of steam

at a higher temperature than is used in the common condensing engine, which is new.

The "late Mr. Watt took out a patent, in 1782, for working steam expansively; and in his specification, dated March 12, 1788, he says: 'My new improvement in steam or fire engines consists in admitting steam into the cylinder of the engine only during some certain part or portion of the descent or ascent of the piston, and using the elastic forces wherewith the said steam expands itself in proceeding to occupy larger spaces as the acting powers on the piston, through the other parts or portions of the length of the stroke of the piston.'

"He then shows, that if steam of 14lb. pressure is admitted into a cylinder, and cut off at one-fourth of the length of the stroke, at half the stroke the pressure was reduced to 7lb.; at three-fourths of the stroke to $4\frac{2}{3}$lb.; and at the end of the stroke, the steam would be reduced to $3\frac{1}{2}$lb., or one-fourth of its original power. He next shows that the sum of all these powers is greater than 57-hundredth parts of the original power multiplied by the length of the stroke, and consequently, that one-fourth the steam thus used produces more than half the effect that four times the quantity would have produced, if worked dense through the whole stroke.

"He then says: 'consequently, the said new or expansive engine is capable of easily raising columns of water, whose weights are equal to 5lb. on every square inch of the area of its piston, by the expenditure of only one-fourth the contents of the cylinder of steam at such stroke.'

"He had previously shown that the engine working dense steam might be loaded to 10lb per square inch of the area of the piston.

"And lastly, he says: 'and though, for example, I have mentioned the admission of one-fourth to the cylinders full of steam, as being the most convenient, yet any other proportion of the contents of the cylinder will produce similar effects, and in practice I actually do vary the proportions as the case requires.'

"The casing of the cylinders, boilers, and steam-pipes, is not new either; but I have never seen it carried to the same extent as it is at present in Cornwall.

"Great and deserving credit is due to the perseverance, energy, and ingenuity of the Cornish engineers for bringing the expansive engine to the state that it now is, and for daily improvements, which, although taken separately may appear trivial, are, in the aggregate, of great importance."

A deputation from the Dutch Government having visited Cornwall, in order to ascertain, by actual inspection, whether the duty performed by the steam engines employed in the mines is equal to what is stated in the monthly reports, the adventurers and agents of the undermentioned mines kindly permitted an experiment of six hours to be made on their several engines, and the duty, as stated below, was the result:—

Wheal Vor, Borlase's engine, 80 inches single, 8 feet stroke,

123,300,593 lbs., lifted one foot. Fowey Consols, Austin's engine, 80 inches single, 9 feet stroke, 122,731,706 lbs., lifted one foot. Wheal Darlington engine, 80 inches single, 8 feet stroke, 78,257,765 lbs., lifted one foot. Charlestown United Mines, 50 inches single, 7 feet 5 inches stroke, 55,912,392, lbs., lifted one foot. Charlestown United Mines stamping engine, 32 inches single, lifting 66 stamps, 60,525,000 lbs., lifted one foot. Wheal Von stamping engine, 36 inches double, lifting 72 stamps, 50,085,000 lbs., lifted one foot.—*Lean's Engine Reporter.*

SAFETY-VALVE FOR STEAM-BOILERS.

At a late meeting of the Society of Arts, the Gold Isis Medal was awarded to Mr. Robert M'Ewen, for a mercurial guage, which answers the double purpose of an indicator of steam-pressure, and a safety-valve for engine-boilers. The novelty of the invention consists in the employment of a mercurial tube as a safety-vent for the steam, these tubes having hitherto been used only as indicators of pressure, and of a length sufficient to allow the steam to acquire a dangerous degree of pressure, without giving any other notice of the fact than what may be observed by the eye. As the action of Mr. M'Ewen's safety-valve depends on a purely physical principle, namely, the opposition of the elastic force of steam to the static pressure of mercury, without a mechanical obstruction of any kind,—it affords a free vent for the steam when its pressure exceeds the limit, corresponding to the length to which the tubes are adjusted, according to the strength of the boiler.

NEW TOWN OF FLEETWOOD.

An important addition has just been made to the facilities of communication between the manufacturing towns and the coast, as well as between the southern parts of England and the lake district of the north. At the port of Wyre, in Lancashire, the new town of Fleetwood has sprung up, and the harbour is one of the largest and most commodious: it has a railway communication with the town of Preston, and, therefore, with Liverpool, Manchester, and London. There had previously been steam communication between Wyre and Ulverstone. The voyage is usually performed in about an hour; and a glance at the map will shew this to be a great accommodation to "the lake school of tourists," both as regards expedition and comfort. The advantage of this fresh opening to commercial enterprise consists mainly in the improvement of an important harbour, with lighthouse, &c. on a most convenient part of the north-west coast, and the establishment of such a communication between Preston and the sea as imparts to that seat of manufactures all the practical benefits of a maritime locality.—*(Times.)* Fleetwood is named after Sir Hesketh Fleetwood, Bart., M.P., to whose enterprise the country is mainly indebted for this noble improvement. A portion of the valley of the Ribble, below Preston, is also named *Hesketh Bank*, in compliment to the public-spirited Baronet.

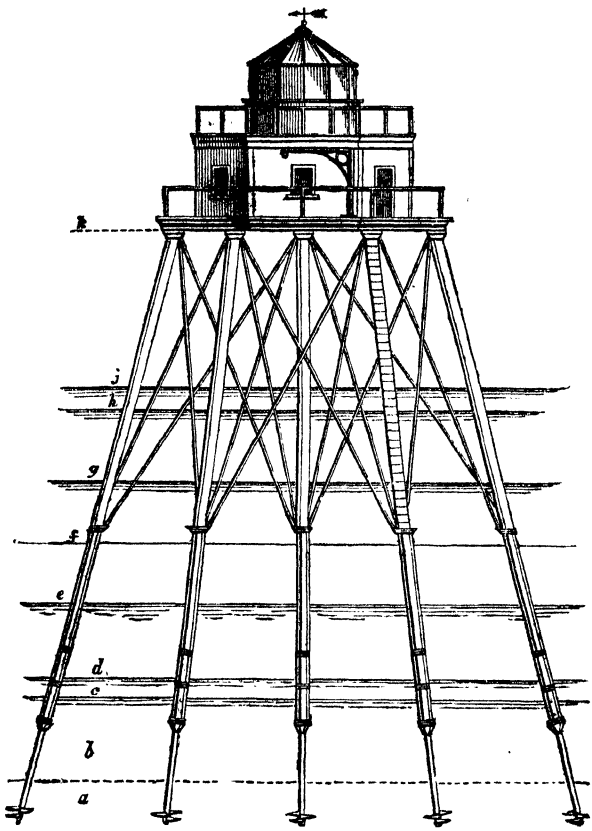
WYRE LIGHTHOUSE.

This screw-pile Lighthouse, the first constructed in the United Kingdom, has been reared on the north-eastern low-water spit of North Wharf Bank, at the entrance of the Wyre Navigation, leading to Port Fleetwood. In planning the navigation, Commander H. M. Denham studied to identify the remotest spit of bank turning into it, without subjecting the mariner to a treacherous light-vessel. He accordingly adopted the application of Mitchell's ingenious mooring-screw * to the insertion and basing of piles or pillars, in sub-marine foundation ; and, by this means, the Wyre Lighthouse was reared in two of the shortest days of the year, not affording *daylight* during the low-water period, spring tides, but depending on flambeaux or moonlight. Commander Denham considers Mitchell's invention to be a perfect mode of establishing lights *out upon the very* banks of a navigation, whereby the power and object of a lighthouse are enhanced by proximity with the anxious observer from sea. In fact, a lighthouse can thus be erected upon any *under water* spit, as indifferent to a thirty feet rise of tide and channel surge, whilst sending forth its light of the same character and stability, as if on the main land; thereby throwing it more intensely and effectively *on the region required*, especially where shoals outlie the main to any extent. Its time in erection is the shortest possible; and, it is so portable a structure, that it may be removed, if local changes require, to another site in a month.

The Wyre Lighthouse presents a well-proportioned group of columns, rising out of the sea, in the intervening and overlapping order that hexagonal or six-angled figures produce, according to the separate angles you may be opposite to ; a systematic interlacing of tension-rods renders the fabric sufficiently opaque, even below the platform ; but above the platform, of twenty-seven feet diameter, is a six-angled dwelling-house of twenty feet diameter, by nine feet high ; on the centre of which rises the twelve-sided lantern, with Chinese roof, of ten feet diameter. Thus, you have a figure of forty-six feet spread at the base, contracting at the platform balcony to twenty-seven feet: it is elevated forty-five feet above low-water level, and affords a steady, bright, uniform light, ranging over an eight-mile horizon, visible ten miles from a coaster's deck, and freed from breaks of brilliancy attending the offing passage from reflector to reflector, by being fitted with a light of deceptive order. Foggy periods are provided for by a self-acting, deep-sounding bell, tolling three strokes of five seconds intervals, at one minute pauses. Tide-time for vessels of twelve-feet draught is denoted by two black balls kept upon the flag-staff until twelve feet ceases upon the straight course right up ; at the same time, however, denoting seventeen feet up through the *buoyed* channel ; and vessels requiring a Wyre pilot will

* An interesting notice of an experiment with Mitchell's patent screw moorings, at the mouth of the Thames, will be found in the Year-Book of Facts, 1840, p. 35.

be understood at this lighthouse, if showing a weft at the peak, besides their pilot-jack at the mast-head; whence a pilot-jack will also be hoisted until she is provided.



(The Wyre Screw-pile Lighthouse.)

A. Marl formation; screws ten feet below low-water mark.
B. Substratum of Sand.
C. Low-water equinoctial Springs.
D. Low-water ordinary Tides, two feet above ditto.
E. Ditto, neap Tides, nine feet ditto.
F. Half-tide level neap Tides, fifteen feet ditto.
G. High-water neap Tides, twenty-one feet ditto.
H. Ditto, ordinary Tides, twenty-eight feet ditto.
J. Ditto, equinoctial Springs, thirty feet ditto.
K. Under-side of Platform, forty-five feet ditto.
Centre of the Decentive Light in the Lantern, [illegible] feet ditto.

The specification will be found in the *Civil Engineer and Architect's Journal*, No. 33, quoted from a very able work, by Commander Denham, lately published at Liverpool.

NEW DOCK AT HARTLEPOOL.

THIS noble Dock was opened in December. Its water surface is twenty acres, which is exactly equal to that of the Old London Dock. It is inferior only in area to that of the two West India Docks, and one of the Commercial Docks in London, but exceeds the largest dock in Liverpool, the *Brunswick Dock*, by five and a half acres; and the largest dock in Hull, the *Old Dock*, by ten acres. Its depth of water will rarely be less than twenty feet, nor ever much exceed twenty-five feet, but will necessarily vary with the high water of the neap and spring tides. The new dock is separated from the outer dock or "tide harbour," by a quay of a length of four hundred yards, forming the base of a vast wooden stage or platform raised to the level of the railway, to which, in fact, it forms the termination.—*Abridged from the Durham Advertiser, Dec.* 11.

NEW HOUSES OF PARLIAMENT.

"A DESCRIPTION of the Coffre Dam at the Site for the New Houses of Parliament," by Grant S. Dalrymple, has been read to the Institution of Civil Engineers. The works detailed are those which necessarily precede the erection of the main building. They consist of the coffre dam, river wall, and the foundations of the river front—according to the designs, and under the direction, of the engineers (Messrs. Walker and Burges) and Mr. Barry, the architect; the whole being executed by Messrs. Lee, the contractors. The extreme length of the coffre dam along the river face is 920 feet; and the ends return at an angle until they meet with and enter the old river wall, at about 200 feet from the face of the dam. At 28 feet 9 inches from the back of the river wall is the foundation of the front wall of the main body of the building, the space between the two walls being filled up with concrete, composed of 10 parts of gravel to 1 part of ground lime. The total length of the river wall, at the present level of 2 feet 3 inches above the Trinity standard of high-water mark, is 876 feet 6 inches. The wings at each end, projecting 2 feet 3 inches before the face of the centre part, are 101 feet 6 inches long each, leaving a clear terrace walk, 673 feet 6 inches long by 32 feet wide, between the wings and fronting of the river. The height of the wall from the bottom of the footing courses is 25 feet 9 inches. The excavation for the wall was commenced on the 1st of January, 1839, and the building of it was begun in March of the same year. The amount of the estimate for the dam and wall was £74,373.

The foundation-stone of the main building has not yet been laid; but the Speaker's house and the parliamentary offices are in rapid progress. Mr. Barry is stated to calculate on the completion of his vast work by the session of 1844.

NAVAL STEAM-ENGINES.

On February 24th, M. Champeaux la Boulaye, Commander of the *Styx* Government steamer, described to the Academy of Sciences, at Paris, some improvements which he had made in Naval Steam-Engines, by a simple modification of the apertures through which the steam issues from the boilers. He has thus increased the power of his engine from 30 to 40 per cent.

At the same sitting, was noticed Lieut. Janvier's new method of fixing the paddle-wheels to the maintree of the engine, which is accomplished by the pressure of a lever upon a metallic disk; the same to be increased or diminished by a few strokes of a hammer; and the wheels can thus be made to remain totally free from action of the tree or axle, or else to revolve with it from a previous state of rest as rapidly as the word of command can be given,—the engine continuing to work all the time. This invention, which has excited the greatest sensation at Toulon, is likely to be adopted in the French navy; and is applicable to old engines.—*Literary Gazette*, No. 1207.

REEFING PADDLE-WHEELS.

Mr. S. Hall, the ingenious deviser of the Condenser which goes by his name, has patented the following invention, which must accomplish a great desideratum in steam navigation. It is a contrivance of the utmost simplicity, by means of which, all the float-boards of both Paddle-wheels of a steam-boat, or either of them, can, at any time, and in any weather, be "Reefed" in a few minutes; or in other words, the diameter of the paddle-wheels be reduced from their extreme size to any other diameter.

Mr. Hall describes his invention to consist, first, in the withdrawing of the float-boards more or less from the peripheries of paddle-wheels toward their centres, and in the returning of them back again at pleasure, for the purpose of regulating the depth of their immersion in the water wherein the vessel to which they are applied is floating, according to circumstances; such as the depth of water the vessel is drawing, the roughness of the sea, the violence of the weather, or any other occurrence which may take place to render such regulations of the situations of the float-boards desirable.

Secondly, not only in the regulating of the float-boards as above described, but in the withdrawing of them entirely out of the water, or as nearly so as possible, when any circumstances render it desirable; such, for instance, as when the wind is so favourable as to render it desirable to sail the vessel entirely thereby, and to cease altogether, during that time, working the engines; and when that is no longer the case, in returning the boards to their proper situation in the water, for the engines to be put in operation.

The details of this patent will be found in the *Mechanics' Magazine*, No. 874.

The first application of these wheels was in the *Lee* iron steamer.

SAILING AND STEAMING VESSELS.

Upwards of ten years since, Messrs. Seaward and Capel, the eminent marine engine-makers, proposed "the plan of navigating ships to India, partly by wind and sails, and partly by steam-power, as an auxiliary," as being greatly preferable to any attempt to steam the whole way, for all purposes, saving only the conveyance of letters and passengers, at the quickest possible rate of speed. They argued that a vessel thus doubly provided, might avail herself of the trade-winds on the voyage, with canvas only, and have recourse to steam-power when beset by calm or foul weather; so as to accomplish the voyage from the Thames to Calcutta, at the rate of 220 miles a day, or, allowing nine days for stoppages, in about seventy-four days in all, which is but two-thirds of the time commonly taken by the swiftest sailing vessels. This plan, however, had not been taken up until the past year, when two East Indiamen, adapted both for steaming and sailing, called the *Vernon* and the *Earl of Hardwicke*, were built by Messrs. Green, of Blackwall, and fitted with auxiliary steam-power by Messrs. Seaward and Capel.

The *Earl of Hardwicke* is of 1600 tons, and is fitted with a steam-engine of thirty-horse power, working paddle-wheels, intended to propel her in the light airs and calms of the tropics. These paddle-wheels are so arranged that they can be shipped or unshipped in a short space of time; indeed, they can be disengaged from the engine in one minute, whenever the vessel is to use her canvas only. The space occupied by her boilers and engine is only twenty-four feet in length, and ten feet width, of the main deck, between the fore and main hatchways; the whole enclosed between decks, no part going into the hold, nor above deck. This engine, (of thirty-horse power,) propels the vessel, in calm and smooth water, five knots an hour; her consumption of fuel is three tons in twenty-four hours; and she draws seventeen feet of water, when full of passengers, troops, and cargo.

The *Vernon*, a sister-ship, with which the experiment of "auxiliary steam" was first made, effected the voyage from Calcutta to Spithead, in a very bad season, in eighty-seven days; notwithstanding she had calms and light airs all the way down the Bay of Bengal, when she used her steam consecutively for eight days and nights; and she came from the Cape to Spithead in thirty-two days, being, we believe, the shortest voyage upon record; during which she used her steam nine days.

THE PRESIDENT STEAM-SHIP.

This stupendous vessel has been described, as regards her main construction, in the *Year-Book of Facts*, 1840, p. 20. Her general appearance is, when her side is viewed, that of a first-class frigate of extraordinary size; her light rigging giving her, at the same time, a most rakish and mischievous appearance. She was completed by the autumn, and left Liverpool on her first voyage to New York in September.

Her interior fittings are very superb, and in the Tudor style: the dining-saloon suite of furniture is oak and rich brown embossed Utrecht velvet, and the tables will accommodate 120 persons. The Ladies' Cabin is white and gold; and the Corridor, of imitative oak, is hung with paintings resembling tapestry, representing the history and achievements of the great Columbus. The lower deck is laid out simply into spacious, light, and airy passages and state-rooms.

The *President's* engines, by Messrs. Fawcett, of Liverpool, are a stupendous work. The architectural design of the frame work is Tudor: the massive clustered columns, surmounted with the pointed and moulded arch, with diagonal stays, and open work in keeping, give to the whole the effect of a handsome Gothic chapel. The beams are beautiful castings, as are the cylinders, and both are of immense size and weight: the polished iron and brass are superb. The whole, engines and boilers, with the water, weigh about 510 tons. The following are the principal dimensions:—

Diameter of Cylinder	80 inches.
Stroke of Engine	7 ft. 6 in.
Weight of Cylinders	11 tons.
Valve-cases from	6 to 6½ tons.
Beams (4) upwards of	5 tons each.
Condensers, about	10 tons.
Gothic columns, 4 pairs, each	11 tons, 7 cwt.
Diagonal Stays, (4,) each	4 tons.
Main, or paddle shaft	9 tons.
Two eduction pipes, each	18 cwt.
Boilers, each	30 tons.
Bed-plates, (2,) each in one casting	15 tons.

IRON STEAMERS.

THE question of the durability of Iron Vessels, of their little liability to accident, and of the ease with which damage done to them may be repaired, appearing to be very clearly proved from experience, a great number of Iron Steamers have been commenced and completed during the past year, among the more important of which are the following:—

The *Archimedes* has made an experimental trip round the Island, or 1,722 miles, in 210 hours; being, on an average, about 8½ miles an hour, in all weathers and states of the tide, than which nothing can be more satisfactory. She answers her helm well, and is under complete command. In putting her about, the water thrown from off the propeller impinges upon the rudder with such force as to cause her to turn in little more than her own length.

The *Sons of the Thames*, built by Messrs. Ditchburn and Mare, and fitted with a pair of 37-horse oscillating engines, by Messrs Penn and Sons, of Greenwich, on Sept. 16, went from Blackwall to Gravesend, (20 miles) in one hour and eleven minutes!

The *Mammoth*, building by the Great Western Ship Company, at

Bristol, will register about 3000 tons; but her actual tonnage will exceed 3600 tons, or about 600 tons more than any ship ever built. An immense saving in stowage will be gained in consequence of the adoption of iron for her hull, whilst her draught of water will be comparatively small. She will, consequently, be able to carry coals sufficient both for her outward and homeward passages—a most important point, when the inferior quality of coals obtainable in America, and the consequent diminution in speed, are considered. Her engines are to be of 1000-horse power, and it is confidently expected that the *average* voyage across the Atlantic will be reduced to *ten* days. She will carry a vast spread of canvas, so that in all probability the engines will frequently be at rest. In consequence of the adoption of Smith's Screw Propeller, this stupendous ship will, we believe, be able to pass the present locks at Cumberland Basin, and discharge her cargo in Bristol Harbour.—*Gloucestershire Chronicle.*

The *Mermaid*, a wrought-iron steam vessel of 160 tons, has been built by Messrs. Ditchburn and Mare, to be propelled by an engine on an entirely new principle of 50-horse power, invented expressly to drive the Archimedes screw without the aid of geering-wheels. Should its power equal its simplicity, it is likely to cause a great change in steam-engines.—*Civil Eng. and Arch. Journ.*, No. 39.

The *Peru*, one of the vessels belonging to the Pacific Steam Navigation Company, built by Messrs. Curling and Young, is a very splendid steamer of 700 tons burthen; her engines of 90-horse power each, are by Messrs. Miller and Ravenhill, and Oram's patent fuel is used in lieu of coal; she is fitted with Capt. Smith's paddle-box boats.

The *Eclipse*, built by Messrs. Napier, of Mill Wall, is said to be decidedly the fastest steamer in England. From her surprising speed and singular appearance, (having two funnels and the piston cross-head working above the deck,) a report got abroad that she was driven by high-pressure steam, which was incorrect. She is propelled by one engine, of 100-horse power, the cylinder 51½ inches diameter, with 4-feet stroke; she has a double bottom, which gives increased strength and safety, and at the same time, affords a large space wherein the steam is conveniently condensed, thus keeping up a regular supply of fresh water to the boilers, and saving nearly the entire power of working an air-pump. She has four separate boilers, any three of which are adequate to supply the engine; so that one may be repaired, without causing delay.—(*Abridged from the Mechanics' Magazine*, No. 883.) The *Eclipse*, during last summer, ran from Deptford to Margate in about 4½ hours; certainly, the greatest speed ever accomplished on British waters.—*Ed. Mechanics' Magazine.*

The *Stromboli* steam-ship, constructed in 1839, for service in the Indian seas, is armed with six guns of large calibre, carrying balls of 105lb. weight a distance of three miles, with tremendous effect. These pieces of ordnance weigh about 65 cwt. each; they are constructed on a new principle, which renders them safe, and easily managed on board

steam-vessels, where the concussion from those formerly used was apt to derange the machinery.

The *Proserpine* war-steamer, built by Messrs. Ditchburne and Mare, of 470 tons, has four sliding keels, nine water-tight bulk-heads, two of which are longitudinal, running the entire length of the engine-room, and is armed with four long guns on non-recoil carriages, her draught not exceeding four feet of water. The engines, by Messrs. Maudsley, are two 45-horse, having the wheels to disconnect, on a new method, to facilitate sailing.

The *Courier*, intended to navigate the *Elbe*, between Hamburg and Magdeburg, has been built hy Messrs. Ditchburn and Mare, and fitted up with engines on the oscillating principle, by Messrs. Penn, who have acquired great eminence for the construction of this class of engines. The vessel is 158 feet long at the water line, her breadth of beam 20 feet; and her draft of water with engines, boilers filled, &c. and 15 tons of fuel on board, is only 19 inches in midships, and 14 inches at stem and stern. The engines are of 32-horse power each; the diameter of the cylinders 34 inches; and the length of stroke 3 feet. The weight of the engines and boilers filled with water is only 37 tons 15 cwt.; and they are well accommodated in an engine-room of half the usual size. The great saving thus effected in weight and space is one of the results of the adoption of the oscillating principle, and may be ranked among its principal advantages. The weight usually assigned, we believe, to river engines is 18 cwt. per horse power, but we are informed that the oscillating engines of the *Courier* weigh under 12 cwt.—*Mechanics' Magazine*, No. 874; *abridged.*

The *Soudan* is one of the three iron steam-vessels built for the Niger Expedition. It is smaller than the other two, the *Albert* and *Wilberforce*, being of only 250 tons, while the tonnage of both the others is 440. The *Soudan*, (the name is a corruption of Habid-es-Sudan, or Friend of the Blacks,) is destined for detached service, when required, up smaller rivers; for conveying intelligence or invalids, and especially for sounding ahead of the other vessels in difficult or unknown navigation. A free circulation of fresh air between decks has been ensured by the erection of a ventilating apparatus, fitted under the able superintendence of Dr. Reid. It consists of a case of sheet iron, about two feet and a half in breadth, and eight inches in thickness, extending all round the sides of the vessel, and provided with mouths, which may be opened and closed at pleasure. The air is driven into this case by means of a large circular fan, which is set in motion by a band communicating to the axle of the paddles; or, when the engine is not in play, to a wheel which may be turned by manual labour. Connected with this is a chamber containing woollen cloths, lime, &c., through which it is intended, whenever the presence of malaria is suspected, the air shall pass previously to being circulated below the ventilating apparatus. Another peculiarity in the construction of this vessel is, that instead of the usual covering provided for the paddle-wheels, two shaloops are so fitted as, when inverted, to supply the place of paddle-boxes.—*Times*, Jan. 14, 1841; *abridged.*

The *Nemesis*.—This splendid vessel, commanded by Capt. W. H. Hall, is the first iron steamer that ever rounded the Cape of Good Hope. She is the largest of her class built, being 168 feet long, 29 feet beam, and 650 tons burden. The engines are of 120-horse power, by Messrs. Foster & Co., of Liverpool; 20 days' coal can, on any emergency, be stowed in her; she carries two medium 32-pound pivot guns, one after the other forward, and 10 swivels; and is manned by 50 seamen. When launched, she drew only 2½ feet of water, and may still be lightened, if necessary, to 4½ feet. Being nearly flat-bottomed, and fitted with iron hawse-holes for cables in the stern, she can be run on shore, and easily got off again by anchors, which contrivances will enable her to land troops, without the assistance of boats. Though thus round-bottomed, two wooden false keels, of 6 feet in depth, can be let down through her bottom, one after the other, forward. These, together with a lee-board, invented by Capt. Hall on the voyage, prevent her, in a considerable degree, from going to leeward. The rudder has a corresponding construction, the true rudder going to the depth of the stern-post, and a false rudder being attached by a pivot to the former, so that it can be triced up or let down to the same depth as the false keels. The floats are easily unshipped; and under canvas, with the wind free, she can go nine or ten knots an hour. The vessel is partitioned by water-tight divisions into five compartments, so that, if even both stem and stern were stove in, she would float. Her accommodations and arrangements of small arms are splendid; and large coal-holes, being placed between the officers' quarters and the sailors' berths' and the engine-room, the heat of the fires is not at all felt. The *Nemesis* left Portsmouth, with secret orders, on March 28, and reached Madeira in seven days, where she took in coals, and then proceeded down the coast of Africa, steaming or sailing, according to circumstances. At Prince's Island, she took in 70 tons of wood, which, with the remaining coals, lasted till she came into the latitude of St. Helena, when she proceeded under canvas, to make the best of her way to Table Bay, thus facing the Southern Ocean, at the very worst season of the year. She arrived at Table Bay on July 1, and having there taken in 200 tons of coals and water, she left on the 11th, and whilst rounding the Cape, experienced several gales of wind; but she proved an admirable sea-boat, buoyantly rising over the immense waves, and shipping little or no water. She, however, was so much damaged in these gales, that Captain Hall put into English River, Delgoa Bay, to repair and refit, which occupied three weeks. Thence the *Nemesis* proceeded to Mozambique, where the Portuguese Government assured Captain Hall that the sight of his steamer would greatly dishearten the persons engaged in the slave-trade, for they would now see that their vessels were no longer safe in the river, as steamers so powerfully armed could follow them over the bars, when the men-of-war could not approach.

From Mozambique, the *Nemesis* continued her voyage towards India, calling at Johanna, where she came direct through the Maldive Islands to Ceylon, sighted Colombo on Oct. 7, and reached Point de

Galle in the afternoon. Thence it was expected the *Nemesis* would proceed to Singapore, and ultimately to China.—*Abridged from the Colombo Observer, Oct.* 12; *Times, Jan.* 11, 1841.

The Propeller has been built by Messrs. Ditchburn and Mare. The engine of 24-horse power, by which her paddle, or propellers, as they are termed, are worked, was made by Mr. J. T. Beale. She is a small vessel, but very elegant in her proportions, and formed to cut through the water with great rapidity. The propellers differ from the paddle-wheels used by other steamers, in being single blades of iron, only one blade on each side of the vessel, and not a series of blades brought into the water by the revolution of wheels. Each blade is very broad and large, and dips almost perpendicularly into the water, so that the concussion formed by the blades of paddle-wheels dipping into the water at angles is avoided, and the consequent unpleasant vibration of the vessel. Directly the blade dips into the water, it is forced back by an arm or limb of iron, performing a motion similar to the leg and foot of an aquatic bird; and by means of this motion the vessel is propelled forward, at the rate of from 10 to 11 knots or miles an hour. The appearance of the propellers is like that of the legs of a grasshopper, and when in motion, their action resembles the legs of that insect in its walk, as well as of a bird. One great advantage is that the propellers occasion no swell in the water, no wake or trough in the river, and no backwater, so that no danger is occasioned to small boats by the rapidity of their progress.—*Times, Oct.* 10.

A STEAM FIRE-ENGINE

Has been invented at New York, by Captain Erichsen. It weighs only 2¼ tons, and will throw 3000lb. of water per minute to a height of 105 feet, through a noozle of 1½ inch diameter.

STEAM-PLOUGH.

A trial has been made near Glasgow, with the Steam-Plough, invented by Mr. Macrae, and Messrs. Edgington and Sons, for the cultivation of Sugar-lands, in British Guiana. The field was laid out similar to those in the colony, which have canals on each side, running parallel with one another. The machinery consists of two iron boats, one containing a small high-pressure steam-engine, with a drum, round which the endless chain or rope is coiled; and the other a reversing pulley, by means of which the chain or rope is extended, and allowed to work whichever way may be required: the ploughs are attached to this chain, and made to work backwards and forwards with great rapidity and accuracy.—*Glasgow Courier; abridged.*

PROGRESS OF RAILWAYS.

It appears that more Railways have been partially or entirely opened in 1840, than in any previous year. The Lines completed, are 4; entirely opened, 10; partially opened before, and further so during the past year, 4; first partially opened, 8: being 26 lines, in

all. The total length of railway in Great Britain brought into operation in 1840, may be set down at upwards of 500 miles.

The great number of Railways thus opened precludes our enumeration of them, respectively; in place of which we subjoin a few details of the *London and Blackwall Railway*, which is altogether peculiar in its mode of working.

This railway is worked, not by locomotive engines, as most other lines are, but by stationary power. The trains are propelled to Blackwall by means of two stationary engines of 120-horse power each, which are worked in shafts sunk to the right and left of the lines. To these engines, fly-wheels, or drums, are attached, each of which weighs forty-three tons, and is twenty-two feet in diameter. A tail-rope is fastened to the drums, which is wound and unwound at each end by the engines. Thus, as the train proceeds to Blackwall, the drums at the London terminus unwind the rope by which the carriages are to be again drawn to London; and to prevent the rope flying too rapidly across the sheaves, (in which it is run in the centre of the rails,) and thus becoming entangled in consequence of no weight being attached to it, a break is placed on the platform beside the railway, at which a man is stationed to regulate the uncoiling of the rope. The whole train is never stopped at the intermediate stations, but the several carriages are attached or detached for their respective places of destination by means of a rope and iron-pin, while the main train is proceeding onward. The drums take eighty turns to every mile of the ropes, each of which is three miles and a half in length. It is not endless, similar to that employed at the Euston station of the London and Birmingham Railway, but is in two parts; namely, one for propelling carriages to Blackwall, and the other for propelling carriages from that place. It was manufactured by Huddart and Co., of Limehouse, and cost upwards of 1,200*l.* The stationary engines cost about 30,000*l.* each.

The Electro-magnetic Telegraph of Messrs. Wheatstone and Cook, (which has been for some time in successful operation on the Great Western line,) is employed on the Blackwall Railway. A telegraph is placed at each terminus and station, so that notice of any impediment or casualty may be conveyed along the entire line within three seconds! Mr. Whishaw's Railway Chronometer is likewise employed here: it has 500 figures upon the face of it, by which a railway-traveller may ascertain the precise rate at which the carriages are going. The engineers, and, we believe, the inventors, of this novel mode of working, are Messrs. George Stephenson and G. R. Bidder; whose design, on its first introduction into the House of Commons, was ridiculed as visionary and impracticable,

Railway Town.—Upon the South-western line, a new town called Kingston-upon-Railway, is fast rising; 800 houses being built or in progress.

Returns.—The following were stated on Jan. 16, 1841, to be the latest Railway Returns for Traffic in One Week. London and Birmingham, 12,068*l.*; Great Western, 4,660*l.*; London and South-

Western, 3,093*l.*; Liverpool and Manchester, 4,154*l.*; Grand Junction, 7,167*l.*; London and Greenwich, 790*l.*; London and Croydon, 422*l.*; London and Brighton (Shoreham Branch,) 99*l.*; London and Blackwall, 422*l.*; Eastern Counties, 434*l.*; Midland Counties, 1,549*l.*; North Midland, 2,220*l.*—*Railway Magazine.*

Manchester and Liverpool.—The net proceeds for the half year ending the 30th of June last, exceed considerably those of the corresponding period of the previous year, the amount for the first six months of 1839 being 48,211*l.*; and for the half-year then concluded, 52,471*l.* These larger proceeds have arisen more from reduced expenditure than increased receipts. The total receipts for the half-year are 126,474*l.* 9*s.* 8*d.*

America.—There are now 2,270 miles of railways completed, or nearly completed, in the United States; besides 2,346 miles of railways in progress of construction, making a total, (when finished,) of 4,616 miles.—*Times, November.*

ROYAL RAILWAY CARRIAGE.

A CARRIAGE has been fitted up for the accommodation of Her Majesty and Prince Albert, and suites, on the Great Western Railway. The whole carriage is 21ft. in length, and 9ft. in width, and divided into 3 compartments, 2 end ones 4ft. 6 inch. long; while the centre forms a noble saloon, 12ft. long and 6ft. 6 inch. in height, and is fitted up in the style of Louis Quatorze, panelled with crimson and white silk, relieved by paintings of the four Elements, by Parris. The sofas, &c., are of richly carved oak. At each end of the carriage is a large window, affording a view of the whole line.

ATMOSPHERIC ENGINE.

MR. E. RUDGE, of Tewkesbury, has patented a new form of Atmospheric Engine for locomotion and other purposes. This engine may consist of two, three, or more open-topped cylinders, placed either vertically or horizontally, the piston-rods of which are connected with two or three throw-cranks. The air below each piston in the cylinder is condensed by a jet of steam, when the prepondering influence of the atmosphere on the external surface of the several pistons produces the available power. The cylinders are lubricated by means of a small funnel on the top of the piston-rod, whence the oil flows into a hollow space within the rod, and thence into a groove turned in the piston. In order to gain a reserve of power, for any particular purpose, a large cylindrical receiver is filled by a condensing air-pump placed on either side, and connected with the main shaft of the engine; thus, when the carriage is descending a hill, the air-pumps will compress the air into the large cylinders, which again will supply the air for working the pistons while ascending a hill.—*Gloucestershire Chronicle.*

THE ATMOSPHERIC RAILWAY.

THIS invention was briefly noticed in the *Year-book of Facts*, 1840,

p. 27. During the past year, several experimental trips have been made upon a line which has been laid down to about the extent of half a mile on the Birmingham, Bristol, and Thames Junction line, across Woomholt Scrubs.

This invention is not a recent novelty, for we remember to have described it in the *Arcana of Science and Art*, 1836; but the manner in which the principle has been made subservient to the purposes of railway conveyance is the contrivance of Messrs. Clegg and Samuda, the present patentees. Indeed, the plan of propelling carriages by a current of air through an exhausted tube, was suggested so long ago as the year 1810. In 1836, Mr. Pinkus suggested a pipe 40 inches in diameter with a slit or groove in the upper surface; the groove was to be closed by laying a rope in it; a piston was to move in the tube to which the rods or bars connecting it with the carriage were attached, wheels were attached to the bar or rod, which lifted up the rope as the piston passed beneath it, and then came another wheel behind the bar or rod, which forced down the rope into its former place, after the passage of the bar had taken place. The defect here seems to have been, that the rope could not be sufficiently forced down so as to make the aperture air-tight. It appears to have been reserved for Messrs. Clegg and Samuda to contrive the effectual method of closing the aperture so as to make it air-tight after the passage of the connecting rods. Their contrivance is this:—A pipe of nine inches is used for the transit of the piston; along the top of it is an aperture. To close the aperture, there is a strip of leather strengthened by plates of iron fixed like a lid, by being attached on one side to the pipe, while the other side falls into a groove filled with a composition of oil and wax. Wheels are attached for opening and closing the valve; and, what is completely a new feature, a heated upper rod passes over the composition after the valve has been closed, melts the composition, soldering down the edge of the valve or lid to the groove, and sealing the tube.

In the above experiments, the mere rate of the carriage, with its passengers, weighing eight tons three cwt., was thirty miles an hour; with the carriage and passengers of five tons thirteen cwt., it traversed the rail at the rate of thirty-six miles an hour; and its rapidity at times was still greater. The cost is stated to be hardly more than a fourth of that of steam, and there are neither explosions to fear, nor the inconvenience of smoke and soot to endure. The train moves, apparently by magic, at 30 miles an hour. Those who have been accustomed to see the cumbrous locomotive engines roaring and smoking along the lines of railway, will be astonished to see a train moving with the rapidity of 30 miles an hour, without any perceptible power to put it into motion, and it is difficult to persuade many persons of the fact that trains can be impelled by means as simple as those employed.

STOPPING RAILWAY TRAINS BY MAGNETISM.

Mr. H. M. Grover, of Boveney, Buckingham, has patented the application of Electro or other Magnetism for the purpose of retaining

or stopping Railway Trains. A magnet, of the ordinary horse-shoe form, is let into a block of wood, and fixed by sustaining rods in such a position that its ends are a short distance from the face of the tire of one of the wheels. A galvanic battery is placed on the bed or platform of the carriage, and a connection of the magnet and face of the tire of the wheel formed when necessary, by means of wires, which cause the wheel to be retarded or stopped. These magnets may be applied to any number of wheels in this manner, or through one magnet to a lever, and indirectly to the wheels.—*Inventor's Advocate.*

RAILWAY WHEELS.

On July 20, a long Report was read to the Academy of Sciences, at Paris, by M. Arago, on the system adopted by M. Arnoux, for the Wheels of Railway Carriages moving on curves of comparatively small radii, and for preventing wheels from getting off straight rails. His method involves some considerable improvements in the springs at the ends of the carriages, and a nearly perfect equalization of friction. The experiments made by M. Arnoux, near Paris, show that trains of vehicles can compass without almost any intermediary, from a line of rails with a radius of three hundred yards, to another with a radius of only ninety yards.

HALL'S PATENT HYDRAULIC BELT.

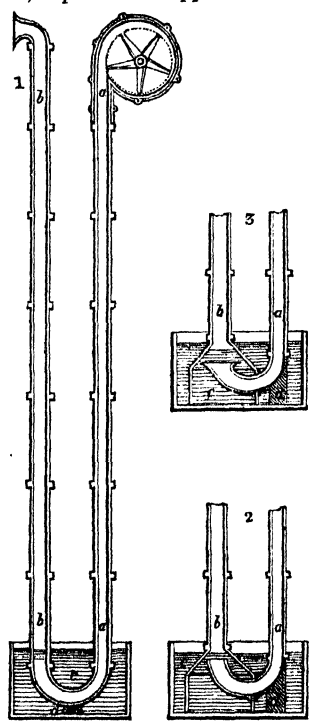
This invention consists of a band passing over pulleys; the one at top, the other at the bottom of the well, or place containing the water to be raised; and when the pulleys are made to revolve, the belt carries up with it a column of water, which is deposited in a reservoir at the top. A working model may be seen at the Polytechnic Institution. It was invented and patented so long since as the year 1834 by a Mr. Childe, of whom the patent has been purchased by its present proprietors, Messrs. Hall. In the *Mechanics' Magazine*, No. 870, the Belt is stated to resemble very closely a Rope Pump described in that work in the year 1827; notwithstanding this lack of originality, the Belt has lately excited considerable interest by its economy and power. The following are the results of two trials, as noted by a Correspondent of the *Mechanics' Magazine*, No. 867. Its power is about 73⅔ per cent., while that of the pump is only 53⅓. The principle by which the water is raised and sustained, is not, as has been erroneously supposed, by *capillary attraction*, or any material absorption by the belt, but simply from the action of the air about the band, which, partaking also of its speed, passes in a continuous current through the water, and so long as the momentum of this exceeds the gravity of the fluid raised, so long will the column be sustained.

NEW METHOD OF RAISING WATER.

Mr. H. Adcock, civil engineer, has patented an invention for Raising Water from Mines, which is wholly unlike every thing which has preceded it, and bids fair to become one of the most important novelties of the day. The apparatus is constructed upon the apparently paradoxical principle of *raising upwards*, which, however, gives a very

inadequate idea of the effect which it produces; and, comparing it with the velocity and quantity of rain descending from the clouds, its effect may be conceived as practically inefficient. And so it would be, were the case at all analogous. But, in an apparatus of this construction erected at the works of Messrs. Milne and Co. at Shaw, near Manchester, where the pressure of the air was a ninth part of a pound upon the inch, the velocity of the rain upwards, and its abundance, were such, that if rain were to descend from the clouds with equal velocity and in equal abundance, it would cover the earth eighteen and a quarter feet in a single minute of time; while, on the contrary, it is well known that not more than twenty-two inches of rain fall in the metropolis in a year.

In the engravings, *Figs.* 1, 2, and 3, represent the apparatus, and *Figs.* 2 and 3 show a variation of the lower part: in each figure, the same letters of reference denoting contrivances to accomplish similar objects. The three kinds of apparatus are shown in the section: *a a* represents a pipe, of zinc, iron, or other material, to convey air from the fan or fanner, or blowing cylinder, to the bottom of the shaft or pit of the mine; or, in a similar manner, air may be conveyed to any required place. or depth, from which water or other liquid must be raised.



b b, Another pipe, somewhat larger than the pipe *a a*, to convey the air aforesaid, and the water which is carried up by it from the mine, in drops like rain, to any required height.

c, The sump, chamber, or reservoir of water to be raised.

d, Metal, stone, or wood, to serve as supports.

By the rapid revolution of the fan, or the upward or downward motion of the piston in the blowing cylinder, by a steam-engine, water-wheel, or other prime mover, imparting motion to it, atmoshperic air of the requisite amount of density is made to flow down the pipe *a a*, and where the pipe turns upwards, in the chamber, or reservoir, *c c*, it comes in contact with the water, disperses it in drops, forces it up the pipe, *b b*, and delivers it at top.

In *Fig.* 1, is represented a series of apertures nearly at the bottom

of the pipe *b b:* through these apertures, the water flows into the pipe *in jets;* there to be met with, dispersed, and carried up the pipe, by the descending stream of air.

In *Figs.* 2 and 3, the pipe *b b*, terminates in a chamber, compounded, in shape, of a cone and cylinder; and the lower part of the cylindrical chamber is perforated with apertures, through which the water flows from the reservoir, or chamber *c c*, into it. The water ascends by the difference of head, above the termination of the air-pipe *a a:* it is there met by the descending current or stream of air; it is dispersed into drops, and carried up by it, as before explained.

Such is the economy of this invention, that it can be put down, even in the deepest pits, at comparatively little cost; for there are *no pumps, no clacks, no valves, not even a pump rod*, but simply one pipe extending to the bottom of the mine, and another pipe united to it, extending from the bottom to the top.— *Civil Engin. and Arch. Jour.* No. 36; *abridged.*

IMPERIAL ROTARY ENGINE-PUMP.

Mr. J. S. Worth, of Manchester, has patented a little hydraulic engine, to which the above title has been given: it is a circular box of seven inches in diameter, by about two inches thick, a winch handle and a suction pipe, with a valve at the bottom, and a delivery pipe, these constituting the whole exterior of the machine. The principle on which it is stated to operate is that of a *perfect vacuum* being produced in the box. The pump discharges a *continuous* stream of water, at the rate of about twenty-five gallons a minute, and that with such ease that a child can work it. It acts both as a lift and a force-pump.—*Mechanics' Magazine*, No. 880.

WHITELAW AND STIRRAT'S PATENT WATER-MILL.

Mr. Whitelaw has published a detailed description of this important invention, (noticed in the *Year-Book of Facts*, 1840, p. 84;) with an account of the performance of one of these machines lately erected at Greenock; to which is added, Information on the subject of Water Power. In this pamphlet, which is a very intelligent exposition of the advantages of the new machine, it is stated that five of these mills "are already in operation, and not a workman has been employed in any way at either of them since they were first set going, although one of them has been in constant use for nearly two years."

AUTOGENOUS SOLDERING.

The term "Autogenous" is employed by the inventor, M. de Richemont, of the method now described, to designate the union of pieces of metal of the same kind with one another, without the intervention of the ordinary alloys of tin, or other connecting medium. This is effected by directing, by means of a fine beak, the flame of a jet of hydrogen on the parts to be united. A complete fusion of the metal is thus effected, and the parts are united in one homogeneous mass,

the metal at the points of junction being in the same state chemically as at the parts untouched. Plates of any thickness, whatever the direction of the edges to be joined, may thus be perfectly united, and the lines of the junction made as strong as the rest of the mass. Common solder, it is well known, is liable to many objections: these are obviated by this process, which M. de Richemont conceives to be very economical in saving solder, and avoiding seams and overlappings; in permitting the use of thinner lead, and the use of lead where it is now inadmissible; and in rendering practicable the repairs of vessels which are now impracticable.

M. de Richemont also applies this jet of flame to heating the common soldering-irons used by tinmen and plumbers. The jet is permitted to play upon the tool, which in a few seconds is brought to the requisite heat, and maintained at that heat without any injury to the tool; and the heat can be regulated with the greatest nicety, by diminishing or increasing the jet. The inventor conceives that the sulphate of zinc produced in the manufacture of the gas will be found of such value as greatly to diminish the cost of this process.—(*Proc. Instit. Civil Engineers*, Feb. 11th.)

A very detailed account of this invention will be found in the *Mechanics' Magazine*, No. 872, translated from a pamphlet published in Paris; and illustrated with engravings. The inventor, M. de Richemont, has received a gold medal for his discovery: some of the most eminent French chemists, (as Gay-Lussac, Thenard, D'Arcet, and Clement Desormes,) have reported very favourably of the utility of the process, and licenses for its use have been taken out by the leading manufacturers of France. Patents have also been obtained for the process in Great Britain and Ireland, of which Mr. Charles Delbruck is the proprietor.

A paper was, on May 14, read before the Liverpool Polytechnic Society, by Mr. Spencer, on the Theory and Practice of Soldering Metals, detailing a process similar to that by Mr. Richemont, and which Mr. Spencer had announced two months before the appearance of M. Richemont's patent.—See *Mechanics' Magazine*, No. 875.

PRINTING FOR THE BLIND.

THE first copy of the Bible ever printed for the use of the Blind, has been completed by Mr. Alston, at the Blind Asylum, in Glasgow. It is in 15 volumes, super-royal quarto, double pica: nine volumes of 200 copies each, and 6 volumes of 250 copies each; in all, 3300 volumes. There are 2470 pages, each page containing 37 lines; 1160 reams of paper, weighing 8½lbs. each ream: 9860lbs. The paper was made on purpose, strongly sized, to retain the impression. In order to account for the great size of the work, it must be borne in mind that it can only be printed on one side of the paper, and that the letters require to be of a considerable size, in order to suit the touch. The printing is effected by a copperplate printing-press. The types being strongly relieved, and liable to give way under the heavy pressure required, it has been necessary to have them recast no less than four times during

the progress of the work. There are in the operative department one man and one boy as compositors, who were taught in the Institution; and one pressman, the ordinary teacher acting as corrector of the press.

The New Testament is completed in four volumes, super-royal quarto, in great primer. There are 623 pages, forty-two lines in each page; 450 reams of paper, the same as made for the Bible, weighing 3,825lbs.; 250 copies.

There have been published altogether by the Glasgow Asylum, 10,850 volumes printed for the Blind.

A NEW MUSKET.

THE French papers give an account of experiments which have been making at Saint-Etienne with a New Musket, the invention of M. Philippe Mathieu. These muskets, called *fusils à six coups*, have, nevertheless, but a single barrel and a single lock. In form, they differ little from the common musket; the most perfect of which has, it is said, no advantage over them either in beauty or lightness. Their direction is more sure, and their danger to the bearer less. The six discharges are independent of each other; so that one or more may be made, and supplied by re-loading separately, or the whole six charges may be fired off, one after the other, and with surprising rapidity. One of these new muskets fired 8,000 charges, without effecting the slightest derangement of the instrument.—*Athenæum.*

MEASUREMENT OF POWER.

ON February 17, M. Morin read to the Academy of Sciences, at Paris, a Note upon two mechanical apparatuses of his own invention, for Measuring the quantity of Power exercised by any machine. According to his method, M. Morin had succeeded in computing exactly the quantity of power borrowed from any steam-engine, and had applied it in several factories in which such power was hired out from one central machine to various persons. One of these machines was destined to count this power during a brief period, and the other could do the same for several weeks.—*Literary Gazette*, No. 1206.

NEW CALCULATING MACHINE.

MR. AIRY has described to the British Association, Mr. Fowler's new Calculating Machine. The origin of this machine was to facilitate the guardians of a poor-law district in Devonshire in calculating the proportions in which the several divisions were to be assessed. The chief peculiarity of the machine is, that instead of our common decimal notation of numbers, in it a ternary notation is used; the digits becoming not tenfold but threefold more valuable as they are placed to the left; thus, 1 and 2 express one and two as in common, but 1 0 express (not ten, but) three, 1 1, four, 1 2, five; but again 2 can be expressed by three, with one taken from it. Now, let $\bar{1}$, written thus, with a small bar above it, mean that it is subtractive; then, 1 2 and 2 $\bar{1}$ are the same in effect, both meaning five; and, for a similar reason, by replacing 2 by its equivalent 1 $\bar{1}$, we have five writ-

ten in three several ways: 2 1, or 1 T T; the last being the form used. It is obvious that by an assemblage of unit digits thus positively or negatively written, any number may be expressed. In the machine, levers are contrived to bring forward the digits 1 or T, as they are required in the process of calculation.—*Athenæum*, No. 679.

ROLLING CURVES.

MR. HOLDITCH has communicated to the *Transactions of the Cambridge Philosophical Society*, Vol. VII. Part 1, an elegant memoir "On Rolling Curves;" the object of which is to determine curves of such a form that, revolving about two centres, one of them may communicate to the other, as in the case of the teeth of wheels; with the condition that the curves, in this communication of motion, are to roll upon each other without friction. Euler, in the *Acta Petropolitana*, has deduced the characteristic property of these curves, but he has not followed out the investigation so as to furnish actual forms of curves; nor has the method of obtaining such curves been pointed out by any previous writer. They are commonly found by a tentative process; but Mr. Holditch thought it worth while to search for rules and forms for their construction; and these he has found and given in the present memoir. Some of the results are very curious and novel.—*Philosophical Magazine*, No. 100.

FELT CLOTH.

THERE has been lately patented a mode of making a kind of Felt, or Cloth, by a pneumatic process, without spinning, weaving, or any analogous machinery. Into an air-tight chamber, is put a quantity of flocculent particles of wool, which, by a kind of winnowing wheel, are kept floating equally; on one side of the chamber is a network, or gauze of metal, communicating with another chamber from which the air can be abstracted by an exhausting syringe, or air-pump; and, on the communications between the chambers being opened, the air rushes with great force to supply the partial vacuum in the exhausted chamber, carrying the flocculent particles against the netting, and so interlacing the fibres, that a cloth of beautiful fabric and close texture is instantaneously made.

MATHEMATICAL POWER-LOOM.

THIS Loom is equally applicable to the manufacture of worsted, cotton, and all other fibrous substances. The machine is called "mathematical," because the quantity of weft or woof is determined by calculation or measurement, thus securing at pleasure cloth of any fabric or stoutness, and perfectly equal throughout. The pressure upon the warp-thread can be carried to suit the strength of the warp; so that the strongest or most delicate yarns can be woven, and a firm or soft fabric produced without any difficulty. This loom performs the whole work of weaving, and will produce a piece of cloth of the ordinary length without the alteration of any of its parts. It has woven two bolts, or thirty yards, of the heaviest sail-cloth in twelve hours and

TO DETECT THE ADULTERATION OF WAX.

MELT a piece of the wax over a gentle fire, and then pour it into a certain quantity of spirit of turpentine, when the wax will entirely dissolve, and the impurities be left behind; and by knowing the weight of the wax, and ascertaining that of the sediment, the proportion of the adulteration can easily be ascertained.—*Journal of the Franklin Institute.*

MODEL ROOMS OF THE BRITISH ASSOCIATION,* AT GLASGOW.

THESE Rooms contained an extensive collection of specimens of Arts and Manufactures, Models of Machinery, &c. Among others, was the original steam-engine, belonging to the University of Glasgow, on which Watt experimented; also the steam-engine of the *Comet*, the first vessel which, for commercial purposes, was propelled by steam in the waters of Europe; and the model of the Blairdrummond water-wheel, used in raising water from the Blairdrummond Moss. There were also numerous specimens of new and improved machines and manufactures, in various branches: a Paisley shawl-loom, in full operation; a collection of Tartans, &c. The process of manufacturing German silver goods was illustrated. Samples of Cotton yarn spun at Newmarket, between the years 1790 and 1800, strikingly contrasted, both in fabric and price, with the yarn spun in 1840. There were likewise, galvanic telegraphs, a rain-gauge, and the model of a life-boat, the latter made entirely of sheet-iron. — *Athenæum*, No. 679.

BLOWING UP OF THE BOYNE.

ON June 24th, Mr. Abbinett resumed his operations on the wreck of the *Boyne*, off South Sea Castle, Spithead, by attempting to fire a charge of 300lb. of powder on the larboard side.† This charge had been prepared and fitted with Government voltaic apparatus, by Serjeant-Major Jones and Corporal Read, and a party of Royal Sappers and Miners, who came from Spithead with one of the Government voltaic batteries, to fire it for Mr. Abbinett, by permission of Col. Pasley. They did not, however, succeed in firing this charge; and a second also failed. The next day, the same party resumed operations, but with another diver, Mr. J. Deane, who placed two charges, one under the larboard, and one under the starboad side of the wreck; which, on being fired, were successful. Volumes of water were thrown up to the height of eight or ten feet, and a great number of fish were killed by both explosions. When one of these charges was fired over the *Boyne*, it communicated a shock which was sensibly felt by a diver who happened to be down at the time, exploring the wreck of the *Royal George*. After the second explosion,

* The Anniversary Meeting was held at Glasgow during the week September 16—23.

† For the details of Mr. Abbinett's operations on the *Boyne* in 1838, see Year-Book of Facts, 1839, p. 70.

Mr. Deane again descended, and found that both sides of the wreck, which stood eight or ten feet high before the explosion, were levelled, so that he could walk into the hull, which was before inaccessible from the outside. Some pieces of timber and several copper bolts were immediately brought up.—*Abridged from the Times.*

BLOWING UP OF THE ROYAL GEORGE.

THE operations upon this celebrated wreck at Spithead, have been continued, by Col. Pasley, at intervals, during the year: but by far the most magnificent exhibition witnessed, was on Wednesday, August 5. It is obvious that no extent of description could convey a just conception of so vast and novel an operation, but it may interest the reader to know, that, under circumstances apparently similar, such very different effects should be produced. On the former occasions, when Col. Pasley exploded his huge cylinders at the bottom of the sea, the water rose to the height of thirty or forty feet, and, generally, in a solid mass, in a form like that of a haycock. But, on the above day, it was forced to the amazing height of, at least, eighty feet, in a sort of pyramid, or set of pyramids and jets, which not only dispersed the water far in the air above, but carried it to the distance of more than 100 yards on every side.

The charge, which consisted of twenty-five barrels, or 2,250lb. was placed at the depth of eleven fathoms and a half, or about seventy feet under the surface, nearly over the original position of the fore-watchway of the old ship. That expert diver, Mr. John Fullagar, of Chatham, having first carefully examined the spot, and made his report, redescended in company with the monstrous cylinder, which he placed in such a way, that, when the powder should be ignited, the mass of mud which obstructed the workmen might be driven away, or so loosened as to allow the tide to carry it off.

Colonel Pasley's operations have been carried on of late, with so much activity, by Lieutenant Symonds and his party at Spithead, that almost all the wreck not quite buried has been dislocated by small charges of powder, and drawn up to the surface. One day in the previous week, a huge mass of the kelson, which lay just above the keel, was recovered. This evidence of the operations having reached very nearly to the lowest part of the wreck, gave great spirits to all concerned; but such were the quantity and the tenacity of the mud, that the labour of extracting the fragments became excessive, and this prodigious explosion was resolved upon, less with a view of tearing asunder the remaining beams, timbers, and planking, than of sweeping out the mud in which they lay imbedded. It may be further remarked, that while, as a mere engineering operation, it would be very disgraceful not to remove every particle of the wreck, that part of the anchorage would be now almost as inconvenient or useless as it formerly was if the dislocated and dispersed fragments were allowed to lie in the way of ships' anchors. All this expense and trouble, therefore, absolutely became necessary, if we wished to have the

finest anchorage in the kingdom, we had almost said in the world, rendered in all its parts fit for Her Majesty's ships to ride in, in all weathers.

The day was very fine, and the collection of yachts and pleasure-vessels, of every size and rig, exceeded all that had been drawn together before, so that Spithead, for a circuit of half a mile round the *Royal George*, was one dense mass of shipping, row-boats, cutters, yawls, schooners; and last, not least, immense steam-boats, crowded halfway up their funnels with strangers from a distance.

When Colonel Pasley's preparative trumpet sounded, the hubbub was instantaneously stilled, and all eyes were turned to the launch in which Lieutenant Symonds stood, with the ends of the connecting wires of the voltaic battery in his hands. Scarcely had the word been given to "Fire!" and the trumpet sounded, when the whole area was shaken as if by an earthquake, the surface becoming ruffled like the top of a glacier; and in the next instant, literally in less than two seconds, the water bulged up and rose to the height of about twenty feet; after which a sort of second burst, or bulge, occurred, which projected the sea in huge masses, as already said, high into the air.

Such was the violence of this effort, that the spray was thrown completely over all the adjacent vessels in a drenching shower, accompanied by a violent gust of wind, radiating from the centre. Immediately a tremendous shout was raised; and when this first involuntary expression of satisfaction was over, three deliberate, joyful cheers from the vast crowd saluted the gallant officer whose perseverance had afforded them so extraordinary a treat.

Various estimates were formed as to the height of the column or columns of water. Some went as far as 100 feet, and some as low as fifty; but the writer is sure that the mass of water could not have been projected less than eighty feet into the air. The commotion in the water, and the ocean of mud, dead fish, and other symptoms of violence, which spread far and near, gave every promise that the operation would answer the purpose which Col. Pasley had in view.—*Abridged from the Times.*

It may here be mentioned, that Lieutenant Symonds has recently recovered from the wreck of the *Edgar* five iron guns, the surface of which, after 129 years' submersion, was converted into very soft carbonate of iron, or plumbago, to a considerable depth.

DREDGE'S SUSPENSION BRIDGES.

On June 13, Mr. Dredge performed a series of experiments before the Professors and Students of the College of Civil Engineers, the results of which illustrated very satisfactorily the two principles of his improvement. These are, *first*, the diminution of the suspension chains from the abutments to the centre of the pendent curve; and, *secondly*, the oblique position of the rods by which the roadway is supported.

The calculations submitted by Mr. Dredge showed the tapered

chain to have, at least, twice the strength of an uniform one, and even more; for an uniform chain gave way when only nine persons were standing upon it, while eighteen persons standing upon the tapered chain, had to jump before they could produce a fracture, the momentum of which must have been equivalent to a very considerable addition of weight.

Yet, even the tapered chain is imperfect, if the roadway is supported by vertical rods; as was clearly shown in a model of the chains, with a spring-beam or steelyard at the centre, a flexible piece of timber for the roadway, and cords for the suspension rods, which could be arranged either vertically, (as in chain bridges of the old construction), or diverging from the centre, as in Mr. Dredge's improvement. When the cords were arranged vertically, and the roadway pressed down, the strain was thrown towards the centre of the chain, as was shown by the action of the spring, which, when Mr. Dredge pressed down the railway with both his hands, indicated a weight of 30lb. or 40lb. straining on the centre. When the suspension cords were arranged obliquely, or converging towards the centre at their lower extremities, the whole chain was called into action; and although the roadway was pressed down with equal or even greater force than before, the spring steelyard remained quiescent, showing there to be not a single pound of unequal tension on the central part of the chains. The bringing up the whole chain into

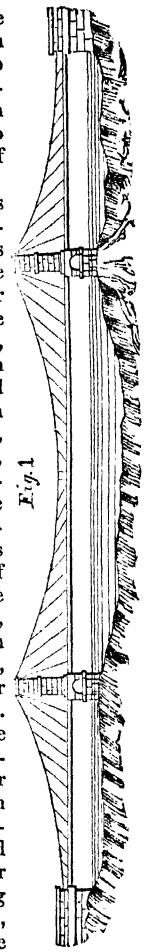


Fig. 1.

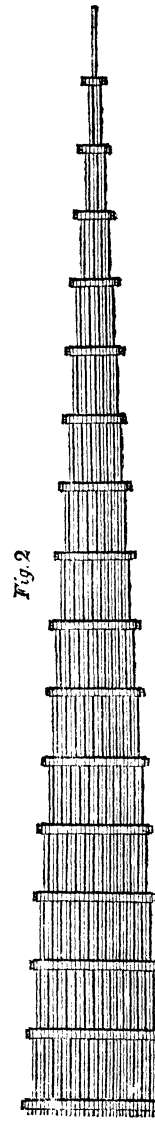


Fig. 2.

Fig. 1. Victoria Bridge, over the Avon, at Bristol; constructed on Mr. Dredge's principle. Fig. 2. A chain, on Mr. Dredge's principle.

action, in whatever way the weight is applied, is a most important feature of Mr. Dredge's improvements. — *Abridged from the Mechanics' Magazine*, No. 884*; *Civil Eng. and Arch. Journal*, No. 33.

PATENT HYDRAULIC LEVEL.

THIS instrument, patented by Mr. Browne, is designed for ascertaining the relative heights of points not visible from each other. It consists of lengths of water-tight flexible tubing, attached to each other by brass joints, and having glass vessels at each end. The vessels and tubing being nearly filled with water, the level of the water, as seen in those vessels at two points, whose relative heights are to be compared, will serve to indicate their positions, whatever may be the inflexions of the tubing between the two vessels. Graduated rods are placed perpendicularly at the points of observation, and the lower vessel is raised, and the higher lowered, until the level of the fluid therein intersects the graduation of the rods. It is conceived that this level may be peculiarly useful in ruins and excavations, and in fixing complicated machinery.—*Mechanics' Magazine*, No. 884.

NEW HYDRAULIC APPARATUS.

MR. JEFFREYS has described to the British Association an improvement on the ancient endless chain of buckets, which he considers of Egyptian origin. This apparatus has hitherto never acquired the value it admits of, on account of a defect in its construction, opposed to geometrical principle—the buckets which bring up the water being fixed outside of instead of within the rope. The effect of this is such an acceleration of the bucket, when it is carried round the wheel at top, as causes it to overtake the water, and carry much of it down again. But, by placing the buckets on the centre side of the ropes, that is, within them, the bucket, when passing round the wheel, being very near the centre, is much retarded, and the momentum of the water causes it to rise out of the bucket very effectually into the trough. A peculiarity in the form of the bucket also prevents the spilling of the water in cases where the motion is very slow.

Sir John Robison observed, upon this communication, that, although the methods (of raising water) in India are rude, yet they give a greater return of work done for power applied than other methods known. Mr. Jeffreys stated that he had tried his method on a large scale, each bucket containing 1½ cwt. of water. A small valve at the bottom of the bucket allows the air to enter, when the bucket is quickly emptied.—*Athenæum*, No. 676.

NEW OVERSHOT WATER WHEEL.

THE great Overshot Wheel, erected by the Kilgetty Colliery Com-

* A spirited letter has been addressed by Lord Western to Viscount Melbourne, calling the attention of the Government to Mr. Dredge's plan.

pany, at Merrixton, near King's Moor, Pembrokeshire, is stated to be the most powerful in the principality, being of 75-horse power; the diameter is forty feet, it is seven feet wide on the breast, and the buckets hold water more than one-third of the circumference. It is fixed in a manner that is quite novel in this country, the wheel being so closely shut in by finely-executed masonry, that the escape of water, without going to the buckets, is impossible. It works by eccentrics, giving a horizontal motion to the cranks, being the first application of this mechanical arrangement to such a purpose. It is adapted to work two pumps, giving twelve strokes a minute to each pump. The water is diverted from the stream about two miles from the wheel; and it is brought to it across the valley by an aqueduct, extending 300 feet in length, and from thirty to forty feet high. This wheel will supersede the use of steam power in the colliery, and it is contrived that, in time of drought, the water to be raised by the wheel will assist to drive it. The wheel and machinery were designed and executed by Mr. Thos. Dyson, of Downham, in Norfolk.—*Abridged from the Cambrian.*

IMPROVED LIFE-BOAT.

THE Rev. Dr. Patterson has described to the British Association, an Improved Life-boat; the principles of which are as follows:—He calls it a Riddle Life-boat; the reason of which is that the bottom of the boat is like a riddle; and the characteristic property of the boat is that it cannot fill with water, as the waves get out as fast as they enter the boat. The sides of the boat consist each of a hollow elliptical tube, to be made of sheet-iron, and from this it has all its buoyancy, which is unaffected by any influx of water. This boat will be light, easily propelled, and will draw only a foot or two of water: it may pass through the most dangerous surf with perfect safety; and, besides being used for reaching vessels in distress, or carrying passengers to steam-boats, it might be itself carried as a ship's boat in voyages, to be ready for use in danger or difficult landing.—*Literary Gazette*, No. 1241.

SEAMAN'S LIFE-PRESERVER.

THIS invention of Mr. A. Symington, of Kettla, consists of a peculiarly constructed jacket or belt, which can be bound at pleasure round the waist: it is light and flexible, and when immersed in water, its buoyancy is so powerful, that it will not only keep the head above water, but also part of the shoulders, and preserve the body afloat for a great length of time.—*Abridged from the Fife Herald.*

DENNETT'S ROCKETS.

MR. GRIMES has described to the British Association, Dennett's Rockets for Preserving Lives from Shipwreck, and read a letter from Captain Denham, stating the range of these rockets to exceed that of the Mortar by one hundred yards; the range of the rockets being about 350 yards, and that of the mortar, 250.

IMPROVED CAPSTAN.

Mr. R. HEDDERWICK, of Glasgow, has invented a Capstan, which has the following advantages over the common ship-capstan :—1. It occupies less room on deck. 2. It can be fitted up in places where it would be impossible to work the common capstan. 3. It is much more powerful, and does not fatigue the men as does the running round with the common capstan. 4. Its power can be increased without requiring any more room on deck. 5. It can be converted into a ship's winch in half a minute. 6. It can be shifted from one part of the vessel to another.—*Abridged from the Greenock Advertiser.*

NEW METHOD OF KYANIZING TIMBER.

THE Manchester and Birmingham Railway Company have Kyanized their wooden sleepers in a much more quick and effectual manner than by the old mode of simply depositing the timber immersed in the prepared liquid. The Company have constructed a cylindrical vessel of wrought-iron plates, five-eighths thick, and double rivetted, and capable of resisting a pressure of 250lbs. on the inch; the dimensions being about 30 feet in length, and six or seven feet in diameter, and the weight about ten tons. This vessel being filled as compactly as possible with wood sleepers, 12 inches broad and 7 inches thick, the liquid is forced in with one of Bramah's hydraulic pumps, and worked by six men to a pressure of 170lb. on the inch. By this means, the timber is completely saturated in ten hours; which process, on the old system, occupied some months.—*Mechanics' Magazine*, No. 870.

GEARY'S PATENT WOOD PAVING.

THIS Patent embraces about twenty differently-formed blocks for paving streets, tram-roads, and railways. The form designated "the bevil shoulder-block" is stated to be superior to all others, and to possess all the advantages of the Whitehall and Oxford-street paving, (considered to be the most successful specimens in the metropolis,) without the objection of pinning. These blocks are on a self-supporting principle, each acting on a shoulder, and cross-jointed; thereby preventing the rising or sinking of any block, but allowing each to be easily taken out for repairing or laying gas or water pipes. Another great advantage of Mr. Geary's plan is the introduction of a pyramid-bearing block in every 10 or 12 feet, so as to divide the pressure, and form the pavement into a succession of arches across the street, instead of one continued bearing-line from curb to curb.—*Abridged from the Mechanics' Magazine*, No. 885.

DRY ROT.—DECAY OF WOOD AND STONE.

THE following valuable facts were communicated by the late Sir Anthony Carlisle to M. J. Staunton, Esq., in reply to an application on the subject of Dry Rot in Timber:

"Many different sorts of decay invade all kinds of timber, and the term '*dry* rot' is often improperly applied, especially to the decays, which entirely depend

"There are two different kinds of destruction of timber, each of them essentially connected with humidity. One of them is produced by a parasitical fungus, which absorbs the fibres of wood when subjected to moisture, and thus disorganizes the natural fabric of wood.

"The other mode of destruction is by decomposition, which may be correctly termed "*rot*," and this occurs from alternate *wet* and dry.

"The solidity of timber is not so durable when the tree has been filled with its growing portion of *sap*; and an unwise Act of Parliament, made to facilitate the barking of oaks, in order to increase the profits upon bark for tanning, directed the felling of those trees after the sap had risen in the spring season, so as to loosen the bark.

"I foretold the injurious consequences of this Act upon the English navy, as a certain cause of fungus rot; but landlords and their ignorant stewards disregarded me, and the Admiralty were soon obliged to *doctor* all the new-built ships for that incurable decay.

"That the absence of moisture secures every sort of timber from decay is shown by the ancient Mummy Cases of Thebes, by the bare roof of Westminster Hall, and the roofs of all our cathedrals and old churches; whereas the modern custom of plastering or painting all wood-work confines the moisture and excludes the air, to the certain destruction of timber, as much as if the beams were fixed endwise in water. The Museum Roof of the London College of Surgeons thus became rotten within thirty years, and the underground wood-work in every damp house is ruined in a similar manner.

The elementary matter of wood is termed carbon, a word comprising solids and solutions, possessing apparently different properties; and on an exact and special knowledge of all these depend the practical uses of those differently modified substances.

"The well-known charred wood, charcoal, the gas termed carbonic, the soluble gum Acacia, and the fluid element of sap of all vegetables, even a cambric handkerchief, are only different states of the same material. But the insolubility of *charcoal*, and the easy solubility of gum Arabic, are opposites, and show the diversities of the carbonic element. Crystallized white marble is a salt of lime, formed by carbon, but not in a state of gas; and in that state it was for a long time called *fixed air*. There are many intermediate states of carbonic fixity; and the rotting of timber exhibits them wherever the fluid sap, as before mentioned, is exposed to decomposition. A remarkable example of this occurs in fishermen's nets, in the herring and mackerel seasons. If the nets so used be suffered to remain even for eighteen hours embued with the mucus and fat of the fish, they heat, ferment, and rot, so as to be utterly worthless; and a similar injury happens to grass-bleaching linen when long confined under snow; likewise in the washing of linen, if it be long exposed to putrescent materials this fermentation is the putrefactive, and it destructively decomposes the solid carbon of the net or cloth.

"Stones which *retain* or *imbibe* water to excess, are, therefore, unfit to be placed in contact with timber in buildings where the construction is designed to be durable.

"Kyan's patent for steeping timber in a solution of mercurial sublimate is only a partial and temporary preventive of *rot*."

ON THE EXPANSION OF ARCHES. BY G. RENNIE, ESQ.

The expansion of solids, which has excited the attention of mathematicians since the investigations of La Hire, in 1688, on a rod of iron, is of particular importance in the construction of bridges, the security of which may be affected by the dilatation and contraction consequent on changes of temperature. Periodical motions, referable only to changes of temperature, were observed by Vicat, in a stone bridge, built over the Dordogne, at Souillac, and have frequently been noticed in structures of all kinds. The different expansibilities of stone and iron have been considered an objection to the use of cast iron pillars in connection with stone, to support the fronts of buildings; but the experiments of Mr. Adie, of Edinburgh, led him to the conclusion that no danger is to be apprehended from a change of temperature affecting cast iron and sandstone in any great degree, as their expansion, so far as regards buildings, may be considered the same. Arguments from this source were employed against the arches of Southwark-bridge, and the experiments set forth in this communication were undertaken with a view of ascertaining the effect of temperature on these arches. Three sets of experiments were made, the first in January, 1818, when the main ribs and diagonal braces rested on their centres, and before any of the spandrils and road plates had been put upon them; the second in August and September of the same year. The rise was measured by the insertion of small wedges, by which the rise was acertained to about $\frac{1}{40}$ of an inch. The most extensive set of experiments was made on the eastern arch. Great care was taken in observing the thermometers, of which there were three, one in the open air, another among the ribs, and the third inserted in the iron of the rib. The result of nine experiments gave as a mean, a rise of $\frac{1}{40}$ of an inch for 1° Fah. The effects of changes of temperature were also observed in the stone bridge over the Thames, at Staines. After the arches had obtained their full settlement, openings were observed in the joints of the parapets immediately over the springing of the arches, and a distortion, or sinking, of the upper curve of the parapets. A wedge was inserted into some of these openings, and the lowest point of its descent, in the month of January, marked. The same wedges were carefully inserted every week until May, when they would no longer enter, and the joints became firmly closed. At this period, however, the joints immediately over the crowns of the arches, which had, during the winter, been quite close, were open. From these facts it follows, as a necessary consequence, that in winter the arch contracting descended, and the spandril joints opened; and in summer the arch expanding rose, and closed these joints, and opened those at the crowns. Thus, the joints of the parapets, which were made of single slabs of granite for the whole height, became good indicators of the change of temperature. It had also been observed in the Waterloo and other bridges, that, joints made good in the

winter with Roman cement, were found crushed in summer. The details of these experiments, and of others, on the expansion of a large portion of the frieze plates, and the calculations to which they give rise, occupy the principal portion of this communication.

NEW PROCESS OF PRINTING IN COLOURS.

Mr. Charles Hancock, the eminent animal painter, has patented a new method of painting, engraving, and printing in colours, so as to present a perfect *fac-simile* of the original. The means are briefly as follow. An outline is first etched and transferred to as many plates as there are positive colours in the picture; and any required gradations of light and shade in each colour are produced upon the plate assigned to that colour, by any of the ordinary modes of engraving. The different plates are then printed from in succession, with the colours appropriate to each; the chief care required being that of adjustment, so that one impression shall not, in the slightest degree, overlay another. Two or three engravers can, by this process, work simultaneously from the same picture, and a greater number of copies can be produced in a given time than has hitherto been done by any other method. The cost of each series of plates is not more than that of one plate engraved in the usual way, the metal only excepted; while against the extra expense of working must be placed the saving of the print-colourer's charge. This process, it is stated, will be found equally valuable to some of our manufactures—in the ornamenting of china, for example, paper-hangings, cottons, silks, &c.; particularly as the process can be applied to surfaces engraved in relief and printed at a type-press, as well as to the ordinary modes of copper-plate engraving and printing.—*Mechanics' Magazine*, No. 872; *abridged*.

GLASS-PAINTING.

Mr. George Godwin, jun., F.R.S. & S.A., in an ingenious paper read at the Institute of British Arhitects, on June 1, observes: "Circumstances are much more favourable in France to the progress of the art of Glass-painting than they are in England. The material is so much cheaper, and the remuneration expected by artists for their labour is so much less, even after making allowances for the difference in the value of money in the two countries, that the greatest obstacles in the way of experimental essays amongst us do not exist there.

"It is really to be desired that some efforts will shortly be made in England by men of authority, to prevent the decay of an art so beautiful and so valuable as this which we are now considering. Its present languid state it is most deplorable to behold, and cannot but terminate fatally, unless means be taken to inspirit and invigorate those who are engaged in it. It is not asked that Government should form large and expensive establishments for this purpose, as at Munich; such a course is unnecessary—perhaps, even, it would be unadvisable; but it does appear exceedingly desirable that they should, by occasional commissions and discriminating assistance, draw public

attention to the subject, raise the hopes of its professors, and offer some inducement for increased exertion on their part. In consequence of the improved state of chemical and physical science, we have the means of producing works in painted glass superior to any thing that has yet been done, were proper encouragement afforded to develope our resources: unfortunately, a directly contrary opinion prevails; and this fact, therefore, cannot be insisted on too vehemently." (Every admirer of art must concur with ourselves in thanking the author of the above paper for his well-directed efforts to revive Glass-painting in this country; and we hope to see his energies successful.) *

EXPANDING MANDREL.

THE Society of Arts have awarded their Large Silver Medal to Mr. J. Hicks, jun. of Bolton, for his invention of an improved expanding Mandrel for turning lathes. It is necessary that a mandrel should fit so accurately, as to bite on the inner surface with a force sufficient to counteract that of the tool; and, in the ordinary mode, the same mandrel cannot be used for two pieces which are of different diameters. Consequently, in many engineering establishments, a stock of mandrels is kept, amounting to 600 or 700. Mr. Hicks proposes to do the same work with eight sizes of the mandrel, from $1\frac{1}{4}$ inch to 10 inches. This he effects by having the spindle of the mandrel shaped on the fustrum of a cone, on the face of which are four dovetail grooves to receive wedges; the under-faces of which have the reverse inclination of the cone, so that the lines of their outside bases are always parallel with the axes of the mandrel. A nut is screwed on the spindle, which acts on the wedge through the medium of a conical cup, which drives them up to their bearings inside the work.—*Mechanics' Magazine*, No. 872.

PATENT STOP WATCH.

MR. P. F. GOUGY, late of Paris, has, in conjunction with Mr. French, of London, patented an improved Stop Watch, which the Editor of the *Mechanics' Magazine* considers to be "one of the most ingenious and useful contributions to horological mechanism," which has been made within his recollection. It enables us, for the first time, to determine with infinitesimal exactness, by means of a common pocket watch, (the improvement, of course, being applied to it,) the precise instant of time at which any particular occurrence takes place; such as an eclipse or occultation of any of the heavenly bodies, the transit of a racer past the winning post; or of a railway locomotive, going at four times the speed of the swiftest racer, past any given point of its course. The bearer of the watch has but to press, with his finger, a small projecting knot at the outer case at the moment the moving ob-

* The error of considering "the ancient art of Glass-painting to be completely lost," will be found explained, upon the authority of Mr. John Martin, the historical painter, in a little work entitled *Popular Errors*: Part III. page 164, Dec. 1840.

ject crosses his vision, and the information is obtained. On referring to the dial-plate, he sees the instant at which the event took place, indicated by a supplementary second-hand, previously concealed from view, by being placed exactly under the ordinary second-hand, and revolving with it, but now made, (by the pressure on the outer knot,) fixed and stationary, until the observation is written off; when, by another pressure of the finger, this supplementary hand is made instantly to resume its original position, and to rotate with the other hand as before—the second wheel continuing in the meantime perfectly undisturbed.

The patentee describes, in his specification, seven different methods of carrying the principle of his admirable invention into effect. The details of the first and best of the methods will be found, illustrated with engravings, in the *Mechanics' Magazine*, No. 882.

NEW ESCAPEMENT.

At the meeting of the Royal Society, on May 5th, a description was read of a new Escapement invented by the late Captain Kater; communicated by his son, Edward Kater, Esq. The great object aimed at by Captain Kater in the construction of the escapement of a chronometer is to communicate equal impulses to the pendulum through some principle perfect in itself, and not dependent for its success on superior execution. In the escapement invented by him, the pendulum merely raises a weight through an increased space in its descent. It neither unlocks a detent nor has any thing to do with the train; and as the weight raised, and the spaces described, are constant quantities, this escapement is, in the strict meaning of the term, one of equal impulse.

ACTION OF SEA-WATER ON IRON.

Mr. D. Mushet has communicated to the Institution of Civil Engineers the result of his analysis of a piece of the iron heel-post of the *John Bull* vessel, which, by the effect of salt-water, was converted into a substance resembling plumbago. This substance was of a dark-drown colour, and easily cut by a knife: on exposure to a red heat in a crucible, it lost about twenty per cent. in weight, and on being exposed to a white heat for four hours, it lost about 60 per cent., and came out a light mass of very brilliant carburet; which being used as a carbonaceous substance for the reduction of an oxide of iron, was found to be less efficacious than the same quantity from the charcoal of wood. From these and other experiments, Mr. Mushet considers 100 parts to be composed as follows:—

Carbonic Acid and Moisture	20
Protoxyde of Iron	35·7
Silt, or earthy matter	7·2
Carbon	41·0

NEW ALLOYS.—CAST STEEL.

A manufacturer, of Paris, has invented a composition much less oxi-

dizable than silver, and which will not melt at less than a heat treble that which silver will bear; the cost being less than 4d. per oz.

An Englishman at Brussels has discovered a mode of casting iron, so that it flows from the furnace pure steel, better than the best cast-steel in England, and almost equal to that which has undergone the process of beating. The cost of this steel is only a farthing per lb. greater than that of cast iron.—*Mining Journal.*

NATIVE ALLOY.—EVERLASTING PENS.

Capt. E. J. Johnson has described to the British Association a Native Alloy, which he proposes to be used for Compass Pivots. Mr. Hawkins stated that he had used this "Native Alloy," (consisting of native crystals of osmium and iridium in conjunction with platinum,) for several years in tipping the points of pens, and not a single instance is known of any of these pens showing the least symptom of wear. He tried Native Alloy on a (compass) cap, in comparison with ruby, when he found that, in the same circumstances, the ruby was ground away with the diamond dust twice as rapidly as the Native Alloy. He had made engravers' tools of the same metal, and when made too sharp they could not be blunted on the Turkey stone, but only by diamond dust. Sir John Robison bore testimony to one of Mr. Hawkins' pens, which he has used four years, not being at all changed.

Capt. Johnson having enumerated the trials to which he had subjected this Alloy, concluded it to be sufficiently tough not to break, and hard enough not to bend, under the trials to which it would be *fairly* exposed; and that being alike free from magnetic properties and liability to oxidation from exposure to the atmosphere, it possesses the requisite qualities for the pivot of the mariner's compass; and he could not but anticipate, that, when fitted with a ruby cap to correspond, it would be found greatly to improve the working. It might also be found advantageous for other instruments, especially for the points of the axes of the dipping needles, fitted on Mr. Fox's plan for use on board ship.—*Athenæum*, No. 678.

FRENCH COINAGE.

The *Moniteur* states that the preliminary experiments for the new Coinage in copper continue to be made under the direction of Baron Thénard. The Minister having directed that an experiment should be made of casting bars of perfectly regular dimensions, and free from all oxidation, composed of 90 to 96 parts copper, and 10 to 4 parts pewter, this has been made with cast iron moulds, with perfect success. By this method, the new money will be free from all oxide; and the operation will be more economical, on account of the cast-iron moulds being able to be worked, as they are in the London Mint, by machinery.—*Mechanics' Magazine*, No. 880.

COMBUSTION OF FUEL.

Mr. Williams has read to the British Association a paper relating

principally to the practical and complete Combustion of Fuel in a furnace, and to the part which air plays to this end. He contends that the material employed and the air admitted should be in equivalent proportions, that is, the air admitted should be in mechanical relation to the quantities of the gases with which it is to combine. And, moreover, that every facility of time and temperature should be given to the perfection of their chemical union. Inattention to these points was the source of incomplete combustion and the cause of smoke. Every attempt to consume smoke by subjecting to great heat has been, and Mr. Williams said, will be, unsuccessful; the object to be obtained is to prevent, and not to remedy, the evil. By a new construction of furnace, by allowing the air to pass therein through numerous jets in no greater quantity than would combine, and by promoting the thorough mixture of the air with the gaseous products of the coal, Mr. Williams has succeeded, on a practical scale, in causing the perfect combustion of coal, and without the formation of smoke. — *Literary Gazette*, No. 1241.

NEW FIRE GRATE.

In the Model-room of the British Association, at Glasgow, has been exhibited a Fire-grate, invented by Mr. Jeffrey; which, he stated, may be placed so far forward as to be quite out of the chimney, and radiate a two-fold quantity of heat into the apartment; and yet there shall be no tendency to send smoke into the room. By an addition, in accordance with the same principle, fresh air is introduced comfortably warmed before it enters the room.—*Athenæum*, No. 678.

STEAM LAUNDRY.

Mr. Wapshare, of Bath, has patented a machine, by which clothes are washed, dried, and ironed in an almost incredibly short space of time. Thus, in the Oxford Union Workhouse, by this contrivance, no less than 1,235 articles of apparel, bed-clothes, &c., were washed, dried, and ironed in two days, with the assistance only of eight women and two girls.

The apparatus consists of a small steam boiler, with two pipes for the conveyance of steam. By the one pipe, the steam is conducted to the coppers used for boiling the clothes, and supplying the washers with hot water; by the other, the steam is carried to a closet or large box, in which the linen is to dried. The exterior of this box is a wooden frame, covered with zinc; within it is fitted up with pipes, increasing in number, according to the extent of drying power required. These pipes are arranged horizontally, one above another, connected at one end by a bend or turn, thus forming a continued duct for the steam. The steam is admitted at the upper pipe, and passes its condensed water at the lowest. On either side of this tier of pipes is a moveable clothes-horse, which is drawn out to be hung with clothes. These horses are made close at the top of the box, so that no heat

may escape over them, and the clothes are so disposed on them as to form an entire sheet completely enclosing, and preventing any escape of the heat radiating from the pipes, by passing through the articles to be dried. This deposition of the clothes is easily accomplished, but difficult of description. On the outside of the horses, or on that side which is not next the pipe, a valve or opening is made on the top of the box, and a current of air being admitted at the bottom, the steam or moist air derived from the clothes as they dry, is carried off as fast as it is generated. One set of these pipes, with two horses, would be sufficient for any moderate family. Attached to the flue that surrounds the boiler is a small oven for heating the irons, so that the whole operation of the laundry, as far as heat is required, is simultaneously effected by one fire.—*Abridged from the Oxford Herald.*

Mr. A. Trevelyan, in the *Mechanics' Magazine*, No. 868, states there to be nothing new in the above invention; and that a drying closet, similar to the above described, may be found in Tredgold's work on *Warming and Ventilating*, p. 309, edit. 1836.

FONTAINEMOREAU'S IMPROVED SYSTEM OF WOOLCOMBING.

THIS is one of the most important inventions which has been made in relation to the wool manufacture for many years: a Correspondent informs us that 93 lbs. of the best wool have been obtained from every 100 lbs. of undressed wool submitted to treatment by this new process. By the common methods in use, 65 per cent. is considered a very large product. By M. Fontainemoreau's new patent system the wool is combed for the most part by machinery, by means of combing engines, (somewhat similar to carding engines, but with two large drums), and is only finished by hand. Both the engines and the hand combs are heated by steam, and it is in a great measure to the beneficial action of the steam that the advantageous results above named are to be attributed.

This manner of heating the combs by steam is more economical than the method now in use of heating them by coal, coke, or charcoal fires; the temperature produced is also more beneficial to the operation of combing, and healthier to the combers employed. The combs, used in the manner hereinbefore described, are of a smaller size than those ordinarily used, being about three inches wide, and the teeth two inches in length; so that women may do the work usually performed by men.

The details of the process, abridged from the Patentee's specification, will be found in the *Mechanics' Magazine*, No. 863.

GLASS WEAVING.

FEW are aware that glass is now woven with silk, although its brittle nature would appear to render such a method of manufacturing it impossible. The fact, however, is indisputable, the new material being substituted for gold and silver thread, than either of which it is more

durable, possessing besides the advantage of never tarnishing. What is technically called the warp, that is, the long-way of any loom-manufactured article, is composed of silk which forms the body and ground-work, on which the pattern in glass appears as the weft or cross work. The requisite flexibility of glass thread for manufacturing purposes is to be ascribed to its extreme fineness, as not less than 50 or 60 of the original threads (produced by steam-engine power) are required to form one thread for the loom. The process is slow, as not more than a yard can be manufactured in 12 hours. The work, however, is extremely beautiful, and comparatively cheap, inasmuch as no similar stuff, where bullion is really introduced, can be purchased for anything like the price at which this is sold: added to this, it is, as far as the glass is concerned, imperishable. Some admirable specimens of the manufactured article may be seen at the Polytechnic Institution, Regent Street, especially two patterns of silver on a blue and red ground, and another of gold on crimson. The jacquard-loom by which it is woven may also be seen at the same establishment.—*Times*.

WOVEN PORTRAIT.

At a *conversazione* lately given by Mr. Morrison to the Institute of British Architects, was exhibited a Portrait of Jacquard in his workshop, planning the construction of the beautiful machinery which now bears his name. This work, worthily entitled "Hommage à J. M. Jacquard," is *woven* with such truth and delicacy as to resemble a fine line engraving: it is the work of Didier, Petit, and Co. "We learned that there were 1,000 threads in each square inch, (French) in both the warp and the woof; and that 24,000 bands of card were used in the manufacture, each band large enough to receive 1,050 holes. Owing to the black threads passing under them, the tone of the highest light was grey, though this was scarcely perceptible. The great difficulty was, it is said, keeping the broad margin round the picture perfectly even in colour, and regular at the lines forming the edge of the picture." —*Mechanics' Magazine*, No. 887.

NEW BALLOON VALVE.

Mr. Gypson, the æronaut, has invented a new valve which he places externally on the top of the balloon, by means of which it is calculated the machine on reaching the earth may be almost instantly emptied of its contents, and rendered stationary, thus enabling the occupants of the car to land without any of those risks arising from the rebounding of the machine, or dragging along the ground. The valve hitherto used opened internally, and its action being, of course, impeded by the upward pressure of the gas, the exhausting of the balloon occupied a considerable time. By this valve, Mr. Gypson states that he has exhausted his balloon completely, and rendered it motionless, in forty seconds.

IMPROVED PAPIER-MACHÉ.

MR. BIELEFELD has published a very interesting Memoir on the origin of Papier-Mâché, the causes of its improvement, and its recent re-introduction for the decoration of the interior and exterior of houses.

The application of steam-power, and the vast improvement, of recent date, in all branches of mechanical science, have enabled Mr. Bielefeld to produce a material similar, in name only, to the Papier-Mâché of the last century: its hard compactness, strength, imperishable nature, lightness, and tractability (if such an expression may be allowed), the facility and quickness with which it may be prepared, put together, and fixed up, and, finally, its cheapness,—are qualities which eminently distinguish it, but which cannot, perhaps, be fully appreciated, excepting by those who have had professional experience in its application. Among the latter, to the architect, builder, house-decorator, the most extensive opportunities are offered for the employment of Mr. Bielefeld's Papier-Mâché; inasmuch as not only all the forms of ornament commonly in use may be executed with it, in every way superior to that with any other material, but its particular qualities are such as to extend the field of invention immeasurably beyond the limits to which it has been hitherto confined. To assert that whatever has been attempted in stucco may be accomplished with the greatest facility in Papier-Mâché, would be very inadequately expressing its capabilities. Whatever the genius of Grinlin Gibbons induced him to attempt in wood, may be effectively performed in Papier-Mâché, with no less sharpness, no less relief, no less lightness, and *much* less liability to injury; Papier-Mâché having this great advantage over wood, that, although as hard, it is tougher, and is wholly without the *grain* in wood, which gives it a bias or tendency to chip off in one direction: but with Papier-Mâché it is wholly different; no matter in what direction a blow falls, nothing but destructive violence will damage it.

In architecture and interior decoration, Papier-Mâché is advantageously used. Nothing can possibly be more to the purpose, in cases where an old, plain, plaster-ceiling, has to be rendered ornamental by the application of panels, pateras, &c.: without disturbing the ground of the ceiling, every kind of enrichment can thus be applied to the surface; and so trifling is the weight of these ornamental additions, that old laths and ceiling-joists can receive them with perfect safety. A new cornice, dry, and ready to colour, can thus be fixed up against an old ceiling, without the delay, rubbish, and dirt, attendant on running a plaster cornice; indeed, without the removal of a single article of furniture, an old ceiling can, in a very few hours, be made, if desired, to assume an entirely new aspect. By the same means, old plain stuccoed walls can be paneled, or otherwise enriched, with equal convenience and dispatch. When, from the lapse of time, or other cause, the enrichments on an old stuccoed or carved ceiling have fallen to pieces; or when, as is not unfrequently the case in works of even recent date, plaster ornaments have detached themselves from the ceiling by merely the operation of their own weight; the injury

is repaired in Papier-Mâché with perfect success; ornaments of great boldness and projection being thus applied to the face of the old work without the least risk, and when, perhaps, the timbers are so slight as to make heavy plaster ornaments highly dangerous. In the completion and decoration of new buildings is a further unlimited range of ornamental purposes to which Papier-Mâché is applicable. Columns of every order and degree of enrichment, including not only the capitals and bases, but the entire shafts, whether fluted in the classic style, or fretted over with arabesques, as in the Cinque-Cento and Elizabethan styles; caryatides, termini, and chimera; are all produced with great facility and but slight cost.

Ceilings, especially, are wholly within the mastery of the manufacturer: those at the Pantheon, in Oxford-street, and Grocers' Hall, near the General Post-office, in London; the vice-regal state rooms of Dublin Castle, and others, which may be referred to, display, in some measure, what may be achieved in Papier-Mâché: yet these, superior as they are in general effect, are specimens of but trivial significance in comparison with the powers and capabilities of the material in the gorgeous details of the magnificent ceilings of the age of Louis Quatorze, which can be fully and permanently executed; and as there is established evidence of the durability of Papier-Mâché in the open air, it of course follows, that in all interior decorations its indestructible quality may be still more implicitly relied on.

For gallery fronts, altar-pieces, organ-cases, and other ornamental parts of churches and chapels, Papier-Mâché has now become generally adopted: nor is its use confined to these more important works; many hundreds of pateras or flowers are annually fixed up on ceilings of the smaller class of private dwellings, in almost every town of the kingdom. Flowers are, further, extensively employed in covering the apertures for ventilation in the ceilings of churches, chapels, and places of public resort: plaster flowers being only with much difficulty, and often times with danger, fixed up in these situations. The wreaths, or enriched bands, which frequently encircle these flowers, are also most effectively and elegantly formed of Papier-Mâché. Another very usual mode of giving enrichment to rooms in the modern style, is to connect with the cornice some guilloche, or fret, upon the face of the ceiling, and, where still more effect is required, adding a frieze under the cornice, against the face of the wall. As in forming these enrichments, the ground is first finished plain, and the foliage in Papier-Mâché then laid upon the face, it is obvious, to the practical man, that a clear relief and distinctness of outline is thereby obtained; quite unattainable in plaster work, where the enrichment is cast with the ground.

Brackets, consoles, and cantilevers, in numerous and tasteful varieties, are made of this substance; and indeed, one of the earliest applications of Mr. Bielefield's improved Papier-Mâché to architectural purposes, was the formation, on the accession of William the Fourth, of several large consoles and cornices, in the state apartments of St. James Palace. Since that time, similar enrichments have been sup-

plied, by the manufacturer, to Grocers' Hall; King's College, Strand; the Carlton Club, and the Oxford and Cambridge Club-houses, in Pall Mall; the British Museum; the state-rooms in Dublin Castle; the Grand Masonic Lodge, Freemasons' Hall; the Corn Exchange; and other public buildings.

Nor need its application be limited to interior decorations. At Paris, the Carton-Pierre, a substance analogous to Papier-Mâché, but in every respect inferior, especially as regards durability, (being very absorbent of moisture, and, consequently, liable to become soft), is largely used for exterior ornaments, even in buildings of the most sumptuous and important character. Not so the Papier-Mâché of English manufacture; as even that of the last century is found, on inspection, to afford abundant proofs of its extreme tenacity in exposed situations. The Papier-Mâche which enriched the fanciful architecture at the back of Sir William Chambers's house, in Berners-street, Oxford-street, now nearly three-fourths of a century old, is still in perfect condition. Mr. Bielefeld's improved Papier-Mâché is of too recent introduction to afford a reference to any example of its adoption in exterior work beyond fourteen years; but several shop-fronts in the metropolis, fitted up of that material, have at this hour their Papier-Mâché enrichments as sound, sharp, and perfect, as when first turned out from the mould.

Another and most important use to which the improved Papier-Mâche may be applied, is that of rendering in duplicate forms the emanations of the sculptor's skill: for whilst any piece of sculpture can be made in fac-simile with perfect fidelity, the weight is scarcely one-sixth that of plaster, and the liability to injury or fracture is in no way to be compared with copies or repetitions in either marble, stone, or wood; whilst the economy of price places the Papier-Mâché specimens beyond all reach of rivalry; as all being finished with equal minuteness and care, they have only to be coloured in representation of the marble originals.

Papier-Mâché is applied by the cabinet-maker and upholsterer, with surprising effect, to the enriched cornices of book-cases and cabinets; to the mouldings, corners, and centre ornaments of paneling on their doors and sides; to the enriched scroll legs of cabinets, and pier tables, in the old French style; to ornamental brackets for clocks, busts, vases; to the enriched borders of rooms hung with silk or paper; the ornamental parts of picture and glass frames, however curved and elaborate in their form; and, also, to window-curtain cornices, the canopies of bedsteads, &c.

With regard to the mode of fixing Papier-Mâché in cabinet work, the simplest and most correct rule is, to treat it as if it were wood, and fasten it by means of brads, needle-points, or glue. It is to be cut with a saw and chisel; and may be bent by steam or heat, planed, and cleaned up with sand paper to the smoothest face, and to the finest arris, if required. The larger objects, such as brackets and canopies, can be made either with a wood core, or wholly of Papier-Mâché: in either case two or three screws secure them in their place.

When fixed, the work can be painted and grained without any previous preparation; and, in gilding, the surface of the work is better adapted to receive the gold than that of any other material; much of the expense and delay usually attendant on the process being thereby saved. The same observation applies to silvering; and, it may be added, the metallic leaf continues untarnished on Papier-Mâché for a greater length of time than on other substances, as may be proved by the specimens at Chesterfield House, and other houses of the nobility. —*Abridged from the Literary World*, vol. iii.

WATER-PROOFING.

On Feb. 17, MM. Robiquet and Dumas reported to the Academy of Sciences, at Paris, "On the water-proof composition of M. Menotti, as applied to all kinds of Stuff." This composition was styled by its inventor, *Savon hydrofuge*, and the nature of it was hitherto a profound secret to all but the members of the examining Commission, to whom M. Menotti had communicated it. The great cheapness of it was one of its principal recommendations: a smock-frock could be dipped in it, and rendered perfectly water-proof, at a cost of only 40 centimes, (about 4d. English.)—*Literary Gazette*, No. 1206.

M. Menotti has since transmitted certificates from various cloth-weavers at Elbeuf, attesting that his *Savon hydrofuge* has completely succeeded in rendering woollen cloth water proof, without destroying the suppleness of the material, or imparting to it disagreeable smell.

IMPROVED PRINTING.

Towards the close of October there was exhibited in Manchester a new Machine for Printing Calicoes, *mousselines-de-laine*, paper-hangings, &c. which excited considerable interest among the trade. The inventor is a M. Chassuis, and the patentee Mr. Richard Beard, of London. It will be fresh in the recollection of those interested in calico-printing, &c. that some few years ago a new machine, designed to carry into effect certain improvements in the printing of calico, &c. was invented by M. Perrote, of Rouen, and exhibited at the Exposition in Paris; and subsequently, the model was removed to Manchester, from which a number of machines were constructed by the Messrs. Lockett, of that town, and which are now in full work near Bury. This machine of Mr. Beard's, it appears, is a decided improvement upon the Periotive, the latter being only capable of working two or three colours; while the Chassuis of Mr. Beard is capable of working, in handsome patterns, in eight different colours; indeed, it might be so adapted as to print, at one time, an almost indefinite number: the economy of the process, and the saving to be effected by it in the prices of printing, will, therefore, doubtless, be very considerable. The eight colours above referred to are worked by means of one copper cylinder and one surface roller; a kind of work which, according to the mode of printing now in use, would require four or five cylinders, and three or four separate blockings by hand. The principle of the invention is simple, works with admirable ease, and

(what is most important to the calico-printer of the whole system), it can, at a comparatively small cost, be adapted to the ordinary machine now in use.

It has been urged by some of the calico-printers who have inspected the Chassuis, as objections, that the pattern design should be formed for the machine, and that it will be of far greater utility to the extensive printer, whose business is of that nature as to be indifferent to his printing 500 copies of one pattern. The patentee has, however, succeeded in shewing there to be not one out of 50 of the present designs that the machine could not print, and that it is equally serviceable to the small printer as to the printer in a large way.

It is admitted that if the patentee can succeed in printing at 3s. 6d. per piece less than the present cost, (which he asserts that he can,) the printer, in his own defence, must use the Chassuis; for the competition in the Manchester trade is, at present, so keen, that the difference of 6d. in the cost of a piece of goods is of the utmost importance.—*Abridged from the Times*, Nov. 4.

IMPROVED ARTILLERY.

On Feb. 17, Baron C. Dupin, in the names of MM. Gay-Lussac and Arago, as well as himself, read to the Academy of Sciences, at Paris, their Report on a new Balistic Pendulum, and Common Pendulum, for testing the force of powder, and the advantages of various kinds of artillery invented by MM. Piobert and Morin. The Report adverted to the originating of experiments of this kind at Woolwich, and mentioned the previous labours of these gentlemen in the science of projectiles. A new kind of butt was used for the more accurate determination of the force of projectiles, consisting of a sort of inverted cone properly stuffed with sand, fascines, and other materials, which admitted the exact degree of penetrating power being ascertained. The Report went on to state that M. Piobert had made an important discovery of the method of preventing explosion of gunpowder—by mixing the *powder*, or dust of gunpowder, always made during the fabrication, with the grained powder; and it was found that such a composition, though highly combustible, had not the same explosive force as the grained gunpowder alone; but when ignited, burnt like a fuse instead of exploding. Powdered saltpetre mixed with the grained powder was found to produce the same effect. When the powder was required for use, it could be immediately made serviceable by passing it through proper sieves. It was stated in the Report, that in case of a war breaking out in Europe, a supply of 50 millions of killogrammes would be required for the army, the navy, and the various garrisons; but as the country only manufactured two millions annually, and even in Napoleon's time never could supply more than that quantity, it became necessary to accumulate vast stores of gunpowder; and, therefore, this invention of M. Piobert might become of immense importance to the safety of all who live near powder magazines.—*Literary Gazette*, No. 1206.

PNEUMATIC MIRROR.

On Feb. 21, Mr. Nasmyth exhibited at the Royal Institution his simple and singular invention, the Pneumatic Mirror, and stated that the objections made to its use for telescopes were merely theoretical, and to be overcome and counter-balanced by the practical benefits to be derived from its application to astronomical purposes. The heating powers of the Pneumatic Mirror are enormous, and realize the traditionary wonders of the burning-glasses of Archimedes. They may yet, in consequence of the facility of adjusting the focus to any distance, be employed offensively and destructively, as it is told of their prototypes at the siege of Syracuse. But, by prototype we mean not to hint that the Pneumatic Mirror is a copy. We agree with Mr. Nasmyth in believing that defective translation gave rise to the report, and that *spicula ardentia* may have been rendered *specula ardentia*. Neither Livy nor Polybius recount burning-glasses among the terror-striking inventions of Archimedes; and, in Rollin's *Ancient History*, they are mentioned as modern tradition. Another application suggested by Mr. Nasmyth, was the bringing to perfection, in our conservatories, tropical plants. By this Mirror the requisite intensity of light, as well as heat, may be concentrated, to produce in plants the brilliant perfection now only to be witnessed in tropical regions.—*Literary Gazette*, No. 1206.

PATENT METALLIC ROPES.

Prof. Gordon, of the University of Glasgow, has described the above invention, which promises to be extensively useful in mines and upon railways, &c.; in fact, wherever ropes of great length and strength are required for engineering purposes. They have been tried with success in the mining districts of the north of England, and a similar trial has been made upon the London and Blackwall Railway.

The manufacture of rope from metallic wire is a German invention. The first experiments on which it was founded were made as long since as the year 1827; but it was not till some years afterwards that a rope was produced which fully answered the ends desired. Several improvements were discovered in the method of manufacture, and about seven or eight years ago the invention was applied to draw mine-rails in shafts, and on inclined planes, in the mines of the Harz-Mountains, and near Bonn, and elsewhere in Germany, with perfect success; and these metallic wire ropes are now almost universally used throughout the mining districts of Germany. Accounts of the ropes have been given at various times in the different scientific journals of that country; and the writer had an opportunity during a residence there of several years, of making himself practically acquainted with their operation, and the method of making them, so that he is enabled to speak in the highest terms of their utility.

Messrs. Newall and Co., of Dundee, have patented in this country a new metallic rope, which is an improvement upon the very best

kinds used in Germany; besides a new machinery of their own invention for manufacturing these ropes with the utmost expedition, cheapness, and accuracy. They have many advantages over the common hempen rope, being safer, lighter, more durable, and cheaper. They are little liable to flaw, as it is hardly possible for many unsound parts in the wires, of which they are formed, to come opposite each other in the same part of the rope; and as every single wire is open to sight, it is easily seen where the ropes have become so much worn as to become unsafe. Hempen ropes often fail without any visible cause, as is well known to all persons engaged in working mines.

For the work required on those railways where the draught is performed by ropes, (as on the London and Birmingham Railway between Euston-square and Camden Town, and along the whole line of the Blackwall Railway), the metallic rope is peculiarly suitable; for there the great *desideratum* is a rope as light as possible, consistent with the necessary degree of strength. The strain on the Blackwall rope, from its own weight alone, is believed to be nearly one-half of the whole strain for which the power of the stationary engines is calculated: in other words, half the strain-power is required to move the rope and machinery itself; and yet the rope, though of such a weight, appears hardly strong enough for perfect safety. A metallic rope of much less weight would, nevertheless, be far stronger.—*Abridged from the Times*, Sept 30.*

This invention has since been claimed by Mr. A. Smith, of Old Broad Street, who states that he patented the same about six years ago, and has since obtained three other patents for improvements. On Sept. 30, one of Mr. Smith's metallic ropes had been used with success on the Blackwall Railway about six weeks.—*Times*, Oct. 1.

MANUFACTURE OF CARDING.

On June 12, Mr. Carpmael explained, at the Royal Institution, the manufacture of Carding (wire brushes), for working cotton, wool, flax, and also, in part, silk. The card, it may be explained, is, of itself, a simple instrument, in appearance like a hair brush, and consisting of a sheath or surface of leather, into which are set fine wire teeth. Its manufacture formerly consisted of many processes, which are now blended into one by Mr. Walton; and the machine, as perfected by him, is a striking instance of skilful mechanical combination. Its various offices are to supply itself with wire from a drum-head wheel, to cut the wire into a proper length, to bend it into the form of a staple, to puncture two holes in the sheath, to pass the staple-form wire through three holes, to force them firmly against it, and then to give the shanks of the wire the required crooked figure. These it performs in rapid succession, and more, because, for the setting of each wire, it is evident that the sheath must be presented to

* In 1838, Count Breunner recommended for deep mines and coal-pits the substitution of ropes made of twisted iron wires, for the flat hempen ropes commonly in use.—See *Year-book of Facts*, 1839, p. 40.

the prickers in a new position; all the wheels, springs, &c. necessary to accomplish which are in action simultaneously, or rather, in strict harmony with the other operations. It was worked by hand by Mr. Carpmael, but it is adapted for motion by steam; and a provision is made, that should the least thing be out of order—should there be the slightest bend in the wire, or the wire out of rule or line, it will immediately throw itself out of gear, and stop. Previously to 1810, these several offices were performed by separate machines, and the hand-and-foot setter, the most expert workman, could only set thirty wires per minute. Since then, Mr. Dyer's machine has been generally used; this combines several of the processes, and can set from 100 to 140 per minute. Mr. Walton's can set from 400 to 500 per minute. In this country, for these cards, 48,000 feet of wire, and about 4000 hides, are cut up weekly; and no hand labour could supply the enormous demand of the present day.

One improvement in the card, unconnected with the machine, is the giving the sheath a surface of India-rubber. The rigidity of the leather caused the bending of the wire teeth by any knotty subtance in the cotton to be a permanent injury; whereas, the elasticity of the caoutchouc enables the bent wire to regain its former correct figure, and thus the instrument is preserved. All the advantages afforded by the natural card, the teasel, are, therefore, obtained by the wire card; and, one more, the leather is not injured by being wetted.—*Literary Gazette*, No. 1222; *abridged*.

EAST INDIAN FLAX.

According to a recent communication from the East Indies, no country in the world, perhaps, produces a larger variety of Flaxes than India; and nowhere has the cultivation of them been less attended to. This circumstance is only accounted for by *the khiar*, or fibres of the cocoa-nut husks, being generally used by the natives. Mr. James Kyd, a shipwright, of Kiddipore, has, however, long directed his attention to the hemps and flaxes indigenous to the country, and he maintains that *the Sun*, if properly cured and dressed, would prove equal to the best samples of Russian hemp, and even, as it has been produced, it is little inferior. All that he considers requisite to bring this hemp to a state of perfection is European superintendence of the growth and manufacture of the material. This conclusion he has arrived at, from having found to answer well nearly 70 acres of *the Sun* hemp, which had been cured and dressed by an English rope-maker settled at Myapore. Mr. Kyd also believes that this flax might be advantageously employed in the manufacture of linen cloths, and especially of canvas; but, as the only looms recognized in Bengal were those worked by the "Tantee" cotton weavers, its properties in this respect could not be tested. *Jute*, another kind of flax, is cultivated extensively, and forms the great staple for domestic purposes. The best *khiar*, manufactured from the fibres of the husk of the cocoa-nut, is brought from Penang and the contiguous islands; the fibres of the nuts grown there being much longer than those pro-

duced by the nuts of Bengal. With this almost all the native vessels are rigged; and it is said to have the peculiar advantage of being specifically lighter than water. Mr. Kyd also describes a remarkably strong, black, fibrous substance, resembling coarse horse hair, called *Ejoo*, and very little known to Europeans. It grows in large tufts, out of corticeous apertures of the Segee palm, which is met with in all the islands bordering upon the Straits of Malacca. Of this material are made cables, and ropes for rigging; and Mr. Kyd has found a cable which had been four years exposed to all weathers raise the bow-anchor of a merchant-ship of 560 tons, buried in the sands of the Hoogly, in two previous attempts at which three Russian cables had given way. The Manilla hemp is used for renewing rigging, and makes exceedingly good tiller ropes. It is the production of the Wild plantain, (*Musa sylvestris*,) and is a native of the Philippine Islands. It runs very long in the fibre, and makes good cloths. The *Yucca angustifolia*, a wild species of aloe, abounds throughout Bengal: the fibres of the leaves average three feet in length, and are exceedingly fine and strong, each fibre being capable of sustaining 1lb. avoirdupois; and the ropes formed of this material have been found to surpass in strength those made of Russian hemp. The *Aloe spicata* thrives prodigiously in all the southern provinces of India, and of its hemp has been manufactured, experimentally, fine canvas. The *Phormium texile* (or Wild Iris) is indigenous to Bengal, and is met with in all the woods of the various districts in that province. The flax it yields resembles as nearly as possible that of New Zealand. The *Kurah*, or wild pine-apple, possesses a fibre so remarkably delicate that the Malays can manufacture from it a cambric which far exceeds in quality the finest French article of that name. It is stated that if an European establishment were formed in Bengal to promote the culture and manufacture of the different families of flaxes peculiar to the country, it could not be otherwise than successful.—*Abridged from the Times*, Sept. 28.

NEW CLOTH.

On March 2, M. Stanilas Julien laid on the table of the Academy of Sciences, at Paris, a specimen of a stuff made in China from the filamentous particles of the *Urtica nivea*. This stuff was called in Chinese, he stated, by the name of *Apou*, or summer cloth; and in southern parts of that empire was as much valued as silk, from its being very light and cool. The quality of the stuff exhibited was to be equal to that of fine cambric.—*Literary Gazette*, No. 1208.

PROPERTIES OF WOOL.

On April 20, an important memoir, by Prof. Chevreul, was presented to the Academy of Sciences, at Paris, on the composition of Wool, the process of extracting the natural grease from it, and certain properties of the substance interesting to manufacturers. M. Chevreul has been pursuing his experiments on wool for fifteen years. He has already proved that when wool has been thoroughly

cleansed, it contains three evident substances: 1st, a flat substance, which remains solid at the ordinary temperature, and is liquid at 60° Centig. (108° Fahr.); 2dly, another fat substance, liquid at 16° (28°); and, 3dly, a filamentous substance, which forms the elementary substance of woven stuffs. Some new experiments have shown him that this latter substance, the filamentous one, contains hydro-sulphuric acid, which is fully entitled to be counted as a fourth component part of wool, and is often of great injury to manufacturers, in their dyeing processes. His experiments to isolate this sulphuric element have lasted four years and a half. The two fat substances of wool correspond to *stearine* and *élaine*, only they admit of being converted into soap; and, therefore, to distinguish them, he terms them *stearerine* and *élaiererine*. The following is a table of the results giving by an examination of, and experimentation upon, a Merino fleece:—

Earthy substances	26·06
Fat substances dissolved by washing	32·74
Fat matters	9·97
Clean wool	31·23
	100·00

M. Chevreul then detailed his methods of isolating the sulphur: the ultimate result which he has been able to obtain being, that, out of 100 parts of pure wool, there are still 46 of sulphur to be deducted. M. Chevreul then developed the importance of these results to manufacturers: he had already shown that nothing was more prejudicial to printing on wool than the presence of certain salts of copper sometimes to be detected in the stuffs, and which always caused a partial discoloration. He recommends that iron cylinders should be used instead of copper ones for printing, together with other precautions: he has clearly ascertained the discolouration to be caused by a sulphate of copper, resulting from the reaction of the sulphur of the wool on a coppery matter, the presence of which is accidental; and he points out the importance of these results to all dyers of woollen goods. M. Chevreul further remarked that the fat component substance of wool enters into it in the same proportion as the oil, which is added to it when thoroughly dressed, in order to make it fit for spinning.

If any difference be found in the weaving of wool when thoroughly washed, and of wool thoroughly dressed, it must be accounted for by the fat substance formed by the *stearerine* and the *élaererine* not being so liquid as oil, and by the former retaining in the wool a certain quantity of earthy matter, very much subdivided, which makes the filaments hard to work. The discovery of the sulphur remaining in the substance of the wool, and standing repeated processes with various metallic oxides and alkaline bases, and still adhering to the wool, after four years' experimentation, is a circumstance considered by the Academy as highly curious.—*Literary Gazette*, No 1215.

PRESERVATION OF WOOD.

On May 4, M. Arago read to the Academy of Sciences, at Paris, ane xtract of a memoir by M. Boucherie, of Paris, on the Preservation of Wood from decay; on the keeping it in a state of greater or less humidity or elasticity ; and on the colouring of it, by the insertion of pyroligneous salts, and other saline or metallic substances. M. Boucherie recommended, as the result of his seven years' experimentation, the pyrolignite of iron, as one of the cheapest and most effectual substances for exsiccating timber, and for changing into insoluble substances the humid and soluble matters that always remain even in the longest dried wood. His method is to place a piece of timber, within forty-eight hours after it has been cut, into a pyroligneous solution, which will be freely absorbed by the capillary action of the tubes. Thus, a poplar tree, thirty-eight metres in height, and forty centimetres in diameter, the foot of which was plunged in only twenty-eight centimetres of pyrolignite of iron, at 8°, was penetrated in every part of this liquid, and, in six days, had absorbed three hectolitres of it. It was not necessary that the tree should be kept upright for this absorption to take place, nor even that the tree should be cut down. M. Boucherie found that by boring a hole through the tree, and making some lateral incisions with saws, and then, by forming a kind of trough round it, so as to allow of liquid entering the hole, the absorption went on with the same rapidity. The time for cutting trees to apply this method of injection to them, or for operating on them by means of incision, is the autumn, not the winter, as has been strongly recommended. All sorts of liquids can be introduced into timber by methods of this kind, except vegetable solutions, which in any species of wood refuse to absorb altogether; and, in general, the neutral liquids are drunk up more abundantly than acid or alkaline solutions.

The central parts of all timber being closer in their grain than the outer parts, never absorb so much liquid as the latter; and among the harder kinds of wood there is a remarkable difference in their powers of penetrability. Some kinds of oak are found to be penetrated to three-quarters of their mass, others to only one-tenth. Branches of trees, the moment they are cut, commence absorbing air; and M. Boucherie, by means of a simple apparatus, has ascertained that a branch will absorb five times its own volume of air. The method of injection is of use for preserving timber in a hurried, and, therefore, elastic state: it is known that certain salts will preserve instead of destroy the soluble substances contained in timber, and the refuse-water from salt-pans has proved to be one of the most effectual substances for this purpose—a result of importance, since this water had always been considered useless.

In order to prevent wood from shrinking, it is necessary that full two-thirds of the original moisture of the tree should be preserved in the timber; and by means of a deliquescent chlorure, M. Boucherie has produced the effect desired. Wood has also been made difficult to burn by the injection of an earthy salt; and two huts being built,

one of wood so prepared, and the other of ordinary wood, and then set fire to, the former was only smothering with the fire when the latter was entirely consumed.

Wood may be tinted by the injection of two liquids, one after the other, which, by their mutual action after absorption, produce a colouring matter: thus, some wood was dyed a magnificent blue by allowing it to absorb successively a salt of iron and the prussiate of potash.

This property of injection, by preserving wood from all attacks of insects, is stated by M. Arago as likely to be of immense importance in the French dockyards, where the ravages of insects, especially the termites, are tremendous. At La Rochelle, the insects have extended their ravages into the town, and forty houses have been attacked by them: even the public record-office has not escaped their ravages. In Paris, too, the new galleries of the Garden of Plants are stated to be much attacked in their timber-work by insects.—*Literary Gazette*, No. 1217.

At a subsequent sitting of the Academy, M. Arago presented a column of pear-tree wood, for purposes of furniture, impregnated with pyrolignite of iron, by M. Boucherie's process, so as to be as black and as hard as ebony.

CUTTING WOOD.

Messrs. Taylor and Wilmot have patented an invention for Cutting Wood into staves for all kinds of cooperage, shingles, park-pales, &c. The block of wood to be cut is first submitted to steam for half or three-quarters of an hour, and softened; which not only does not injure the fibre, but by destroying animal life and vegetable fungi, greatly improves the substance, and renders it more durable. It is then presented to the knives, either acting in a perpendicular direction and chopping right down, or set in circular iron plates, and working with immense velocity as they go round, cutting the block into the required forms in length, breadth, and thickness, with perfect accuracy. The stroke, or the circular cut, (as either machine is employed,) is as easy as if it was slicing butter, and there is not a particle of sawdust, chipping, or waste of any kind.—*Abridged from the Literary Gazette*, No. 1234.

IMPROVED PLOUGH.

Mr. R. Cooper, of Pebworth, near Evesham, Worcestershire, has patented an improved Plough, for forming trenches for the purpose of draining land; and which by its construction may easily be removed from place to place. The wheels which carry the plough are placed on a cranked axle, which may be regulated by a screw and screw-wheel, so as to accommodate it to uneven ground, or the side of a hill. Just before the shears are two revolving coulters, which cut into and divide the surface of the ground. The distance of these from each other is regulated by a screw passing through them both; the depth of their cut may also be regulated by a simple apparatus of socket and pins. Just behind these are placed the coulters for form-

ing the sides of the trench, behind which, and in the same inclination, are land plates for the purpose of preserving the side of the trench so formed. A flat share with a cutting edge performs the horizontal cut, and the mould, as it is cut from the trench, ascends an inclined plane, and is deposited in an individual stream along the side of the trench on the right hand of the person driving the plough.—*Inventor's Advocate.*

ADULTERATION OF BONE DUST.

It appears that saw dust, slacked lime, and numerous other ingredients, are now mixed with Bone Manure; so that in some cases the admixture not only destroys the nutritive qualities of the bone dust, but is most injurious to turnip seed. The great increase in the use of this fertiliser renders these facts important. Large quantities are now imported from abroad, in addition to the enormous mass annually collected in this country;—thus it appears that in 1823 the declared value of bones imported was £14,395; in 1837 it was £254,600, and since that period that amount has probably doubled.—*Quarterly Journal of Agriculture.*

MANUFACTURE OF CIDER AND PERRY.

Messrs. Jones and Ham have patented the following improved method of Manufacturing Cider and Perry. The manufacture of *sweet* cider and perry is *an art*—the mere act of grinding and expressing the juice from the apple or pear, and then putting it into casks, leaving nature to finish the operation, has no title to be dignified by that term. In the latter case, the delightful acido-saccharine juice is converted by the unchecked process of fermentation into an acrid, thin, austere liquor, which no one would touch but those accustomed to it; and it is only marketable among the labouring part of the community, fetching the lowest price, whilst the manufactured article is in fact a *wine*, and as such bears a proportionately higher value. In making use of this term "manufactured," we must not be understood to imply that any foreign or chemical ingredients whatever are introduced into the liquor; and if that be ever done, the patent which we are now about to describe is intended to accomplish the effect of keeping the sweets in the cider or perry by no other method than by a rapid process of filtration. The greater tendency of the juice of the apple or pear to run through the whole process of fermentation, above that of the grape in the southern part of Europe, arises from an excessive quantity of a *ferment* in the fruit, in proportion to the quantity of pure sugar in the juice, and a considerable portion of this *ferment* must be separated before its action becomes too violent. The mode of accomplishing this by the patentees is by double bags compressed into so small a space, (and yet exposing a great filtering surface,) that 120 of them will not occupy a space of more than four feet square. The mouths of these bags are fastened in their places by hollow plugs, which are easily removed, so that the bags can be taken out and replaced with great rapidity when they become choked by the process

of filtration; but this process would not be effectual without the use of an article which arrests all the floating feculencies that occasion the fretting and hissing, and yet adds neither taste nor smell to the liquor passing through it; and this is merely well burnt and pure wood charcoal pulverized. The patent also includes a mill for grinding the fruit, different from any thing hitherto in use either in Devonshire or Herefordshire. It is a roller converted into a *rasp*, by tools supplied with it, so that it can always be restored to its original roughness when by use it is worn too smooth.—*Mechanics' Magazine.*

FIRE-ESCAPES.

An interesting and important Report on the subject of Fire Escapes has been presented to the Police Committee of the Corporation of London, from Mr. D. W. Harvey, the City Police Commissioner, and Mr. Braidwood, the Superintendent of the London Fire Brigade. The object of the Reporters was to decide upon the best plan for a Fire Escape in the City of London.—The models and explanatory suggestions brought under the review of the Committee exceeded 30 in number, each of which embraced one or more of three distinct objects:—

"1. Machines intended for domestic use only, to be resorted to by inmates of houses in case of fire.

"2. Machines to be externally applied, and made to combine the security of property with the protection of persons.

"3. Machines exclusively for the protection of life from fire, to be externally applied, under the responsible direction of the police."

The Committee add, that the principal objects were simplicity and strength of structure, facility of working, and of transfer from place to place, and the ready varying of elevation.

The Committee then selected from models, each of which possesses exclusive advantages; and they did not hesitate to embrace the great advantage which a combination of excellences, not exclusively the property of either, materially afforded.

In the far greater number of instances, the fire-ladders now used by the London Brigade have been found, when promptly at hand, fully adequate to the purpose of rendering assistance to persons in danger; and although other machines and contrivances may be brought to bear in the wide streets and upon lofty houses, in the narrow streets, courts, and alleys, which abound in the City of London, no other instrument can be effectually used.

But, at present, the brigade ladder is only in partial use, under the direction of the fire brigade, and in co-operation with engines exclusively employed for the extinction of fire and the rescue of property.

To render these ladders at all available, they must be placed under the responsible superintendence of the police, at intervals not exceeding a quarter of a mile, and upon carriages which will hold the several parts or joints of the ladders compactly together, until they arrive at the spot required.

To carry the suggestion into effect of having a set of ladders at all

times available within the prescribed space, the Committee find that the number required for the city of London will not exceed 20.

Each of the machines, which has been finished, and exhibited, embraces some of the requisite qualifications, but not one combines the whole.

The fire-escape of Mr. Davies is by far the most simple, and the mode of descent superior to any other, where it can be applied; the metal basket in a great measure screening those in it from the smoke or partial flames from the lower windows: but the entire machine is ponderous, and requires greater aid to move it with celerity than can always be obtained at the instant, while its unchangeable length restricts its action to all but the wider streets.

The machine of Mr. Wivell, which has been for some time before the public, is superior to that of Mr. Davies, in so far as it is capable of some reduction, as well as extension, and moves on a carriage of easier guidance: yet its fixed length of 35 feet, and the great strain it requires to elevate it, together with the impediment occasioned to its progress by an adverse wind acting upon the canvas, and its inapplicability to the narrow streets which abound in the City, are decided difficulties to its adoption.

The sliding-ladders of Mr. Gregory, when placed upon the carriage of Mr. Wivell, form the machine which, upon the whole, is recommended for adoption in the city of London. The utmost length of these ladders, when travelling, is 24 feet, at which height they may be instantly raised, and without being moved can be quickly extended to 40 feet, and, with a little contrivance, may be carried considerably higher.

This machine may be drawn along the streets quickly, and quickly elevated by two men, while the method of raising the additional length is simple, and unincumbered with cordage and other contrivances which complicate many of the fire-escapes submitted to our inspection.

To have a set of brigade ladders, on a fitting carriage, in which are to be stored the ropes, belts, canvas, bag, and other conveniences to facilitate descent, at intervals sufficiently near to be in actual use within five minutes after the discovery of a fire, would require 20 complete sets, and would cause an outlay of from £300 to £400.

Ten of Gregory's ladders, mounted as before described, and similarly equipped as the other ladders, should be assigned to appropriate localities, and committed during the hours of the night to the charge of ten constables.

The cost of these ladders, with the carriages and equipments, would be between £300 and £400, to which must be added the constant charge of ten constables.

Mr. Wivell has invented a machine, which has, for its merit, been attached to the establishment of the Royal Society for the Protection of Life from Fire. This machine consists of a water-cart and a ladder 29 feet long; the ladder has a folding-joint, which allows of its being placed on the cart in a manageable form; lines and buckets are at-

tached, by which water can be conveyed into the first and second floors. As a proof of the celerity with which the machine may be brought into action, intelligence was taken from Brunswick-square to a supposed station 400 yards distant; the water-cart was brought, the ladder raised, and eight buckets of water handed up to the height on the second floor, in five minutes and a few seconds. At a fire in Middle-row, Holborn, the cart from Bedford-row arrived in three minutes; and the fire-escape stationed against the Foundling Hospital in seven minutes, after the alarm was given.

Mr. Baddeley's popular *resumé*, in the *Mechanics' Magazine*, No. 863, states the total number of Fires in the metropolis, in the year 1839, to have been 584; number of lives lost, 32; alarms from fires in chimneys, 101; false alarms, 70; total number of calls on the London Fire-Engine Establishment, same as in the year 1838, viz. 755.

SMOKE PROTECTOR.

Mr. Wallace has exhibited and explained to the British Association his Apparatus for enabling persons to enter places on fire without danger from smoke, by means of breathing through water. A box of tin, containing the water, is placed on a man's back with tubes connected, forming a ring round the body and straps for the shoulders. A hood of Macintosh cloth, glazed in front, is put on the head, and being attached to the side tubes, four gallons of water will enable a person to bear the densest smoke for twenty minutes. The Protector resembles the diving apparatus in appearance.

REPAIR OF BLACKFRIARS BRIDGE.

This extensive work (noticed in the *Year-book of Facts*, 1839, p. 40) has been completed in the most substantial, elegant, and satisfactory manner; and the Bridge has been re-opened to the public. The following details of the work are from the *Times* journal, describing the ceremony of the re-opening. The whole repair has occupied six years.

In the prosecution of their labours, the engineers, Messrs. Walker and Burges, had to contend with no ordinary difficulties. They naturally expected to be furnished with some plans or other information as to the construction of the bridge. They were disappointed in that expectation. The bridge was built under the direction of the city of London, but there did not appear to be any plans or documents in the possession of the Corporation that gave the smallest assistance in any of the objects of the inquiry. An engraved elevation was published in 1766, the year the bridge was opened, and some of the engravings of the caissons and machinery used in the building were published in 1787: these were obtained, but their authority was too questionable to be depended upon. A thorough survey was therefore made of the foundations and superstructure by Messrs. Walker and Burges; and a specification was drawn up by them, which formed the basis of the beautiful repairs which have been just completed.

The timber which formed the foundation of the piers was in a sound and perfect state. The specimens, when first cut, appeared as bright and fresh coloured as new timber. Every part of the bridge, so far as could be ascertained, was built of Portland stone, which is of a soft calcareous nature, and subject to decay from exposure to the weather; but the stonework from the foundation up to low-water mark was as good as it could have been on the day it was laid; the mortar was entire in the joints, and the tool-marks were remaining on the faces of the stones.

As respected the state of the bridge itself, it might be safely affirmed, that up to low-water mark it was perfect, and that the imperfections of the stonework began from that level. From the level of low-water before the removal of London-bridge to nearly the high-water mark, the whole of the stonework forming the front of the piers and abutments was in so very dilapidated a condition as to make new facing with better stone the only prudent and safe plan of repair. The ends or cutwaters of the piers, being more exposed to blows from barges and ice, were still more damaged, and so shallow as to render a renewal from the footing absolutely necessary. Previously to the removal of London-bridge, the low-water mark was seldom under the top of the offset courses of the piers, and in the great proportion of tides still higher, so as to protect the first course above the footings, which was in a much better condition than those above it. The result of the removal of the old bridge had been to reduce the level of low water about 22 inches at Blackfriars-bridge. From the very dilapidated state of the cutwaters of the piers, the columns which rested upon them were endangered, particularly towards their bases, which the high tides had reached, and decayed the stone. Some of them had besides been struck by barges, which had displaced the lower stones of the shafts, so that the columns were really in a dangerous condition. A heavy blow on the disturbed stones might have been the means of throwing down the column altogether, and the recess over it would have followed; the consequences of which might have been very serious, both with reference to the lives of the persons in the barge, and of those in the recess at the time, who would probably have been precipitated with the falling column into the river. The finish of the cutwater, which formed the foundation on which the columns stood, has been raised 2 feet 8 inches, the low level having been the cause of the decay near the bases referred to. This was the more necessary when the addition to the rise of the tides was considered. The columns, no doubt, originally stood level with the high water of spring tides, and they were so shown on the engraved elevations; but the standard of ordinary spring tides, as fixed by the Trinity-house in 1800, was ten inches on the average above the foot of the columns, so that the London-bridge dam being removed, the bases were generally covered with water at spring tides. The alteration improves the appearance of the columns, and this is the only point in which Mr. Walker has interfered with the architecture of the bridge.

The broken and defective arch stones were measured one by one,

and all taken out and replaced with new arch stones; the whole of the facing and soffits of the arches were thoroughly cleaned, the joints pointed with pozzolano mortar; and generally, in addition to what has been stated, every part of the bridge has been thoroughly repaired. The foot paving on both sides has been made good with new granite, and the steps of the watermen's stairs are of new granite. We have already stated that the bridge has been lowered in the centre, and gradually raised at each end, to the great accommodation of all persons engaged in traffic, and to those who ride and drive; and we have spoken of other advantages to the public from the completion of the work, but the improvements in the bridge are much more palpable when viewed from the river than from the streets upon either side.

The above sketch of what has been done will give some idea of the credit due to those who projected, superintended, and aided in the operations.

The estimate of Messrs. Walker and Burges was as follows:—

The cost of the repairs above low water	£60,000
The piling and otherwise securing the foundations, done in cofferdams	30,000
Making together	90,000
Mr. David Mackintosh took the contract included in the specification as above at	£64,000
For making solid parapet, and lowering foot and carriage ways	10,035
Making together	£74,035

By which it is calculated that the contractor must be a loser.

SAFETY BEACON ON THE GOODWIN SANDS.

A SAFETY BEACON has been erected on the celebrated Goodwin Sands, in the Downs. It consists of a column about forty feet above the level of a sea, surmounted by a flagstaff ten feet high. There is a gallery large enough to hold twenty persons round the top of the column, made of sail cloth; access to which is easy by ropes and cleets. A barrel of fresh water, together with a painted bag, enclosing a flag of distress, is stationed on the gallery, and the words "Hoist the flag," painted in the language of all nations, on boards placed round the inner part of the gallery; so that the foreigner as well as the native seaman may be enabled to show a signal of distress, and obtain help from shore, which is about seven miles distant from the Beacon. The means by which the beacon has been erected in so extraordinary a place as the Goodwin Sands are as follow:—The foundation of the column is several feet below the surface of the sand, and is secured in the centre of a stout oak platform, extending from it on either side several yards. This is secured by upwards of two tons of pig-iron ballast being lashed to it. In addition to this, eight stout iron bars, each six feet long, are driven obliquely on each quarter of the column, and two also put at a distance of twelve feet on each quarter, and chains attached to them, communicating with the upper part of the column and the gal-

lery. The sands for three or four hours during the tides are high and dry, and present a fine tract of level, extending for several miles. Captain Bullock, R. N., is the inventor of this remarkable Beacon.

Since the erection of the above Pillar, Lieut. Worthington has constructed a model, 15 feet in extent, of an erection upon the Goodwin Sands, upon a more comprehensive scale than Capt. Bullock's Beacon. Lieut. Worthington's plan exhibits an equilateral triangle, fastened by a perpendicular upright in the centre; at the bottom of which, and of each of the three uprights which form the triangle, there is a massive boss, or circle, of cast iron, ten feet high, flanked by cast iron, at right angles, at the bottom, of five feet in width. Upon these four massive bases the whole wooden superstructure is built. These iron bosses are sunk into the sand, which is supposed to have three several strata—first, loose, shifting sand; secondly, more settled, or concrete sand; and thirdly, chalk rock. When once fixed, the machine is supposed to be immoveable. It is upwards of forty feet in height, and its sides are forty feet in length. Its *visibility* in thick and blowing weather is of the utmost importance.

The triangular form gives the greatest stability, as it presents the least resistance to wind and sea. The angles may be so placed as to point to the most open and exposed parts of the horizon; and the upright principals are constructed in a manner to combine strength, and to afford facilities for uniting the framework, without being weakened by mortices. The frame-work does not embody large masses of timber; but it is so arranged as to combine the greatest possible firmness. The most simple and ready facilities are placed to afford ascent and descent in every case. The platform on the top braces the whole together very strongly. On this platform there is a Beacon and a roundhouse; the former crowns the latter, and may be seen from afar, by its elevated position. A light, a boat, a gun, a bell, a flagstaff, and every minor requisite that might be brought into use upon emergencies, are also provided. By a little attention it will be perceived, that if any one of the angles should be inclined to settle more than the others, there is a reciprocal force, in a threefold degree, acting against it: it can scarcely be imagined how one part of the Beacon could sink down, or be lifted up, without the whole moving together; and the latter is inconceivable. It is added that it would cost the Government but a trifling sum, compared with its importance, to carry Mr. Worthington's scheme into complete and, it is believed, successful effect*.—*Abridged from the Dover Telegraph, Nov.*

NEW ACCESS TO THE RIVER MERSEY.

THE following is an extract from a paper read, December 1839, to the Literary and Philosophical Society, at Liverpool, by J. Brookes

* In the awful hurricane of September, 1833, the inhabitants of Ramsgate, through their telescope, witnessed the men in the rigging of a vessel which had struck upon the Sands, wringing their hands and imploring help in vain —under the perfect conviction that the *next tide would be fatal to them.* The hardy Deal boatmen could only venture within a certain distance of the sufferers, their boats being but as children's toys in the whirling fury of the breakers.

Yates, Esq., on the rapid and extensive changes which have taken place at the entrance to the river Mersey, and the means now adopted for establishing an easy and direct access thereto. After adverting to the frequent representations of Captain H. M. Denham, R.N., F.R.S., marine surveyor, and the results emanating from his surveys of Liverpool, the author proceeded, in detail, to state, "That Capt. Denham had been indefatigable in watching the shifting of the sands, and at length announced as his opinion, that a diagonal channel might be forced in aid of the ebb current, direct to the sea; this, he added, would afford a better channel than heretofore. The proposition was much opposed and jeered at as a vain attempt to oppose, in an open sea, the power of the elements eight miles seaward of the river's mouth; but, at length, he was enabled to commence operations at the close of last year over an area of three-quarters of a mile by one-third, and there now exists, (the earliest by three hours into the port,) a channel, admitting large ships, and recognized by authority as the Victoria Channel, through which, indeed, the greater part of the trade of Liverpool already passes, and which seems destined to be the future great avenue to the port. Such complete success of the design is a sufficient recommendation to the conservators of those harbours which may resemble Liverpool, and where human efforts are likely, in any degree, to aid the great mechanics of nature!" Captain Denham, we observe, is now engaged in giving opinions on other ports, and is rapidly carrying out his plans for deepening and straightening the Wyre navigation up to Port Fleetwood.—*Literary Gazette*, No. 1203.

THE PORTSMOUTH FLOATING BRIDGE

Is seventy feet in length, and sixty feet in breadth, and will hold, on each side, besides passengers, two rows of carriages, seventy feet long: she is impelled by two engines, twenty-horse power each, the cylinders being eighteen inches in diameter, and the length of the stroke three feet. The average rate of the engines will be about thirty strokes per minute; and the average speed about 350 feet per minute; so that she will perform the passage, (2,200 feet,) in about seven minutes. She only draws, with all her machinery on board, two feet nine inches; and fifty tons additional weight will only sink her four inches.—*Times*.

DRAINING THE HAARLEM LAKE.

Mr. Fairbairn has exhibited to the British Association a model of an engine for raising water, which he has suggested for the purpose of draining the Lake of Haarlem, in Holland, which covers upwards of 50,000 acres. It was his opinion that this could be accomplished by the application of a Cornish engine of from 200 to 300 horse power, attached to a scoop 30 feet square, the one end of which was made to move on a centre. In the bottom of this scoop, which was curved, were several valves, opening upwards, on the side nearest the engine. By the descending stroke of the engine, this side was immersed in the water, and filled by the valves. The returning stroke, or rather the

weights attached to the other end of the beam, raised the scoop, and threw the water into a canal at a higher level than the lake. Such an engine as he proposed would lift seventeen tons of water at each stroke, and make seven or eight strokes a minute. The average depth of the lake is ten feet. The engine was so constructed as to give the dipping of the scoop a longer or shorter stroke as required.—*Literary Gazette.*

Mr. Taylor mentioned, that Commissioners from the Dutch government had visited Cornwall, to ascertain the duty done by the Cornish engines. Several experiments had been made at their request, and the following was the result:—

		Feet stroke.	Lifted one foot.
Wheal Vor, Borlase's engine...	80 in.	single 8.0	123,300,593lb.
Fowey Consols, Austin's.....	80	.. 9.0	122,731,766
Wheal Darlington engine.....	80	.. 8.0	78,257,675
Charlestown United Mines.....	50	.. 7.5	55,912,392
Ditto Stamping engine.....	32	lifting 66 stamps	60,525,000
Wheal Vor, ditto.....	36	dble. lifting 72 stamps	50,085,000

TRAFFIC OF LONDON.

THE following account was taken in King William-street, London Bridge, of the number of Carriages of various descriptions, which passed from 8 o'clock in the morning till 8 in the evening of the 19th August:—

From 8	to 9	o'clock....	903	From 3	to 4	o'clock....	975
9	10	....	997	4	5	....	1,053
10	11	....	895	5	6	....	812
11	12	....	1,015	6	7	....	771
12	1	....	984	7	8	....	894
1	2	....	806				
2	3	....	905			Total..	11,010

This averages 97 an hour, or 15 in every minute; and it is fair to presume that there is no street in the world where so many carriages pass and repass in one day. On the 1st September, several persons were engaged to ascertain the number of Foot Passengers, who passed through King William-street, from 8 in the morning till 8 in the evening, and the result was as follows:—

From 8	to 9	o'clock....	3,600	From 3	to 4	o'clock	4,480
9	10	....	4,460	4	5	....	5,280
10	11	....	4,380	5	6	....	4,480
11	12	....	4,620	6	7	....	3,945
12	1	....	3,900	7	8	....	6,720
1	2	....	3,840				
2	3	....	4,300			Total....	53,505

This statement will be found equal in number to 4,555½ per hour, or 74 in every minute. The number of persons supposed to pass in and with carriages, (averaging two to each,) amounts to 22,020, which, added to the above, makes a total of 75,505 passengers in 12 hours.—*Communicated to the Times*, Sept. 23.

ENGLISH ROADS.

THERE are 22,000 miles of Turnpike Roads in England and Wales; upon which there are mortgages to the amount of £8,365,267; being an increase of £1,040,464 in the last nine years. The annual receipts

are under £1,500,000; the expense of repairs, £36 per mile per annum; of improvements, £9 per mile; and of surveyors' salaries, and other charges, £6 per mile.—*Literary Gazette*, No. 1235.

DURABILITY OF STONE.

At a meeting of the Institute of British Architects, Mr. C. H. Smith stated that Henry the Seventh's Chapel, at Westminster, upon the restoration of which £40,000 have been expended, is already in a state of decay, and in twenty years will be a ruin; from the softest of the Bath stones, (Farley-down,) having been employed in the work. Mr. Smith added that the same sort of stone was then being used for the restoration in progress at the Abbey. In a previous lecture, Mr. Smith stated that that portion of the Banqueting-house, at Whitehall, which was restored a few years ago, namely, the festoons and decorations at the top, were of Reigate stone, which inevitably decays when used externally. Mr. Smith added that, in all cases, the north and east sides of old buildings are found to be in a better state of preservation than the south and west sides, in consequence, doubtless, of the greater alterations of temperature to which they are exposed.

MAKING SMALL RAPID WATERS CARRY WEIGHTS AGAINST THEIR STREAMS.

M. Fouard has proposed to the Academy of Sciences, at Paris, a plan to make certain narrow and rapid currents of water drive weights upwards towards their source. He proposes to have rails laid on each side of the canal, or stream, and the axle of a carriage (striding, we suppose, the canal,) to be the axle of a water-wheel having curved paddles like those proposed by M. Poncelet, which the water acting on will drive backwards, and, of course, force the carriage and its load forward.—*Times*.

IRON FOR SHIP-BUILDING.

Mr. Fairbairn has read to the British Association a paper on this subject, in which he went into the extent to which the strength of iron plates was affected by the rivet-holes; and the general deduction made from his experiment was, that there was a loss equal to about thirty-two per cent. As to the comparative strength and safety of iron boats, it seemed to be a general opinion that they were preferable to wood in these respects. Mr. F. predicted that iron would entirely supersede wood in the course of four or five years.

One of the largest iron-built ships of the year is the *John Garrow*, of 800 tons: her rigging is of wire, and except her tops and decks, she is exclusively of iron. She is named after the principal in the firm in Liverpool, who are her owners.—*Newcastle Chronicle*.

PRIMITIVE NAVAL ARCHITECTURE.

It is worthy of remark, that the proportions of the *British Queen* steam-ship, one of the latest triumphs of marine architecture that has interested the world, are exactly those of Noah's Ark, the first that was

set afloat, proving that 4,000 years of practical science has done nothing to improve the dimensions of floating boats. The breadth of the Ark was one-sixth of the length; the depth thereof one-tenth of the length. The *British Queen* is 40ft. 6in. wide; stem to stern-post 243ft. aloft; whole depth 29; making the square depth, 24ft 6in. The Ark was twice as long as the *Queen.—Hampshire Telegraph.*

BEST FORMS OF VESSELS.

MR. SCOTT RUSSELL has submitted to the British Association the proceedings of the Committee appointed last year to conduct experiments on the Forms of Vessels.

By means of a simple apparatus, experiments were made of from a small scale up to 100 feet in length, over a sheet of water from 100 feet to half a mile or a mile in length. For each scale of experiments, strings, cords, and ropes of various thickness were employed; and for the most delicate experiments, a slender Indian fibre, brought home by Sir John Robison, had been found most useful. Two chronometers, by Robert, of Paris, also brought over by Sir John Robison, were employed with great advantage, as observations were obtained which could be depended on within two-tenth parts of a second. The nature of the experiments was two-fold. The next point to be determined was, the general method of conducting the experimental inquiry, so as to elicit the most valuable truths, and those most apposite to practical art. For this purpose, the most eminent ship-builders were consulted, as to the points upon which they most wanted information, and were requested to point out what were the forms of vessels which they would wish to have tried. More than 100 models of vessels of various sizes, from 40 inches to 25 feet in length, have been constructed. These were drawn through the water with various velocities, and at different degrees of immersion, so as to determine the resistance of all the various forms that might be adopted in practice, and enable the builder to adopt the form best suited to his purpose. Of these experiments, different series were conducted with very various objects. One class regarded the transverse sections of ships; another the water-lines of the bow; another the water-lines of the stern; another the form of riband-line and of buttock-lines; another class, the place of greatest breadth, and so on. From these experiments, it resulted that vessels might be made fuller than usual at some points, and finer in others, with great advantage. A peculiar class of lines, called by Mr. Russell "wave lines," appeared best adapted for high velocities both in smooth water and at sea. It also appeared, that the manner in which the particles were displaced by a moving body, and replaced themselves after its passage, was very different from what was generally supposed. There likewise appeared to be three different conditions of fluid motion and resistance, accompanied with distinct characteristic phenomena: motion slower than that of the wave—motion on the wave—motion on wings of water. The last occurred only at very high velocities, when two high

and beautiful films of water spread themselves in the air, and carried the boat as on gossamer wings along the surface of the water.—*Athenæum*, No. 677; *abridged*.

Mr. Russell would scarcely venture to state what may be the result of this exquisite phenomenon: the speed to be obtained with ease may be railway pace; and when a ship mounts her gossamers she may truly be said to be riding on the waves, or, for others' fancy, to be taking flight. The form best adapted for this very swift passage appears to be a bow exceedingly fine and sharp, with the stern very full and very capacious. These results, however, were merely given for others to draw their own conclusions. Already, 2800 separate experiments had been made; it was intended that 10,000 should complete the series. They were so far completed as to justify the Committee to point out the results to shipwrights to approve and adopt. Eight vessels were building and built on the new principle.—*Literary Gazette*, No. 1239.

SUPERB BOAT.

The President of the United States has sent several presents to the Sultan of Muscat; among which is a Pleasure-boat, built at New York, by Crolius, under the direction of Livingston. It is thirty feet long by four feet wide, clinker-built, of white cedar, and copper fastened. Her outside is enamelled white, and beautifully polished; the gun-whale and row-locks are lined with rich silver plate; and the tiller, the rudder, the stancheons for supporting the awning, and the crescent with which each stancheon is surmounted, are all heavily plated. The floor of the boat is covered with Brussels carpet; and the awning is of fine linen lined with silk; the seats and the sides are cushioned with rich damask silk, and the tiller-ropes and tassels are also of silk.

CANAL LOCKAGE.

Mr. Smith, of Deanston, has exhibited to the British Association, a model of a new plan of Lockage, which promises to be of great value to Canal Navigation. The advantages are stated to be that the descent in each lock will not be more than twelve to eighteen inches, that the locks are opened by the passage of the vessels, that they shut of themselves, that the vessels do not require to stop, and that little or no water is lost. The lock-gate is hinged at the bottom; the upper portion, which is round, floats at the level of the higher part of the water; it is pressed down by the bow of the vessel in passing, and when it has passed rises to its former position.

EXPERIMENTAL AEROSTATION.

Mr. Green, the aeronaut, has long entertained the opinion that a balloon voyage from the Continent of America to Europe may be safely effected; a conclusion founded upon repeated observations on the atmosphere, and a conviction that, whatever may be the direction of the winds below, the current of air above invariably traverses from

some point between the north and west. Mr. Green has kept a regular log of all his numerous voyages. To get into and remain in this current, it is, however, necessary that the balloon should be kept at a certain altitude; and to show how this could be effected has been the object of some experiments exhibited in the lecture-room of the Polytechnic Institution, Regent-street. Mr. Green proposes to employ a machine composed of two fans, or blades of wood, attached to a spindle, which passes through the bottom of the balloon-car. The fans are of one longitudinal piece, to the centre of which the spindle is fixed, after the manner of a windmill, but with two wings, or arms; and their blades present a given angle horizontally, in which direction they move. For experiment, a balloon of about three feet diameter was filled with common coal gas. To this were attached the hoop, netting, and car; in the latter, a small piece of mechanism being placed to give motion to the fans. The balloon was then balanced; that is, a sufficient weight was placed in the car to keep it suspended in the air, without the capacity to rise, or inclination to sink. By touching a stop in the mechanism, Mr. Green immediately communicated a rapid rotatory motion to the fans; when the machine steadily rose to the ceiling, from which it continued to rebound until the clockwork had run out, when it instantaneously fell. The experiment was then reversed. The balloon was first raised into the air, and then balanced: the fans were then put in motion, which, however, forced the balloon to the floor. A still more interesting effect was then exhibited. The balloon, with the attached guide-rope, bearing a small brass weight, was balanced, as before. The fans were removed from under the car, and placed sideways upon it, so that their action became vertical. Upon motion being communicated, the balloon floated in a horizontal line, dragging the guide-rope after it, with the weight trailing along the floor: and continued to do so, until the mechanism ceased, when it again became stationary. Mr. Green is convinced that by the above simple means a voyage across the Atlantic may be performed as easily as one from Vauxhall Gardens to Nassau; only three or four days being sufficient for the passage. The size of the fans requisite for the Nassau balloon will be about six feet in length; the machinery being placed inside the car.—*Abridged from the Times.*

THE TURBINE.

Mr. Gordon has explained to the British Association the employment of the Turbine as a recipient of water power, which is but little known in this country, but which has, for some years, excited the greatest interest on the Continent of Europe. The fundamental principle upon which the construction of the Turbine is based, is that by which the maximum of useful effect is obtained from a given fall of water; depending on the relative velocity of the water and its recipient, which ought to be such that the water enters the wheel without shock, and quits it again without velocity. Borda, Burdin, and Poncelet, have successively proposed wheels on this principle; and the well-

known Barker's mill has recently been attempted to be so constructed as to include this principle, by Mr. Whitelaw, of Glasgow, whose large wheel at the Shaws Water-works is said to have produced admirable results; the efficiency being reported to be 90 per cent. of the theoretical effect of the existing power. Barker's mill, in any form hitherto employed, has not yielded as much as 50 per cent. The Turbine of Fourneyron differs very materially from all that had been previously proposed. A notion of its construction may readily be formed by supposing an ordinary water-wheel, with curved buckets, laid on its side, the water being made to enter from the interior of the wheel by the inner circumference of the crown, flowing along the buckets, and escaping at the outer circumference. For a Turbine of about five-horse power, the fall is 3 feet, and the expenditure of water equal to 20 cubic feet per second. The machine consists essentially of, 1st. A reservoir; the bottom of which is divided into radial compartments by curved plates, serving to guide the water to take a particular direction of efflux. 2d. A circular sluice, capable of nicety of adjustment. 3d. The wheel with curved buckets. Reference was then made to the principal Turbines erected in France and Germany; particularly to that at Inval near Gisors, and those at Müllbach and Moussay, as instances of falls of from 6′ 6″ to 11 feet, from twenty to forty-two horse power. And again to those at St. Blazien in the Black Forest, as instances of very high falls, the one being 70½ feet, the other 345 feet. The one wheel weighs 105 lbs.; the other 35 lbs. The conclusions, drawn from a series of careful experiments on these wheels, with a perfectly constructed brake dynamometer, or friction strap, conducted by Mr. Morin, are these:—1st. That Turbines are with equal advantage applicable for high and for low falls. 2d. That their net useful effect equals 70 to 78 per cent. of the theoretical effect of the power. 3d. That they may work at very different speeds above and below that corresponding to the maximum of useful effect; the useful effect varying, nevertheless, very little from the maximum. And, 4th. that they work at very considerable depths under water, the relation of useful to theoretical effect not being thereby notably diminished. The power of the one wheel at St. Blazien is fifty-six horse power; that of the other, of which a drawing full size was shewn, is fifty-eight horse power. This is 14½ inches diameter. Its extreme depth or breast is 225 inches, or less than one quarter. It makes 2200 to 2300 revolutions per minute. Its efficiency is reported to be 80 to 85 per cent. The factory consists of 8000 water-spindles; 34 fine, and 36 coarse, carding engines; 2 cleansers, and other accessories. Mr. Gordon stated that the theory of the effects of the Turbine is very perfect; and that Poncelet has published an admirable pamphlet, entitled "Théorie des Effets Mécaniques de la Turbin Fourneyron," where the theory differs very little from that to be offered.—*Literary Gazette*, No. 1240; *abridged**.

* See Notices of the Turbine, in the Year-book of Facts, 1839, p. 68; and in the Year-book, 1840, p. 83.

CAOUTCHOUC.

THIS most remarkable article, which, only a few years ago, was sent to this country as ballast, now sells, in a fine state, as high as 10s. to 11s. per pound, when spun into thread. One firm spins as much India rubber thread every week as would reach from London to Canton, the country it is imported from. There are twelve patents for this article, and these patents have cost more to defend in law than the amount paid for India rubber since the article has been known to us as of any value. Experiments are now making in England and France to apply the article to the cure of Consumption!

NOVEL APPLICATION OF CAOUTCHOUC.

ON May 29, Mr. Brockedon detailed to the Royal Institution his "New Application of Caoutchouc." This was, to the stopping of bottles, decanters, and other vessels, by means of a mould or form of felted wool covered with India rubber. Humboldt mentions, in his Researches, that the natives of South America use the material for stopping vessels. In that low latitude, the softness and elasticity of Caoutchouc always remains; but in the winter of our climate it sets so hard, that, once placed in the bottle, and hardened there, it could not be withdrawn. This appeared to present an insuperable difficulty to the adoption of Caoutchouc in England for the same purpose; but a plug has been formed of felted wool, then covered with a thin sheet or film of rubber, the hardening of the rubber never equalling the elasticity of the wool: and thus a light, elastic, and impermeable stopper, perfectly air-tight and durable, has been obtained. Mr. Brockedon then described the preparation of the wool:—Threads are bundled together in the form of a long rope, and then fulled until the fibres felt and consolidate to the degree of hardness required. This, for stoppers as a substitute for common corks, is left soft enough to remain cylindrical, and be pressed into the vessel. The stopper is shorter than a cork, and is placed in the bottle with much greater facility than by the present bottling process; for the stopper fitting, with slight pressure, perfectly air-tight, condenses the air in the neck of the bottle, and would spring out again, but that a small wire with a groove in it is first placed in the mouth of the bottle: the stopper is then pressed with the finger down in its place, and the air escapes through the groove in the wire. The wire is then withdrawn, and the stopper kept in its place by the pressure of the atmosphere as well as its adhesion to the neck of the bottle. So perfectly may the air be thus withdrawn, that not a particle shall remain in the bottle, and the mass will appear like crystal. If the liquid be effervescent, a flat disk of metal is to be wired over the top of the stopper and the bottle. For stopping decanters, the wool rope is felted hard enough to be turned in a lathe into the conical form required: this is covered with the sheet rubber; and this stopper is, upon slight moisture, so air-tight, that the most delicate wines may be kept in perfect condition from day to day whilst a glass remains in the bottle. Some claret-drinkers, who do not drink a bottle a day, will feel this to be a valuable discovery. These stoppers are manufactured by Mordan and [illegible] nother form

of stopper is, the overlaying of flat felt with a shell of rubber, and then cutting out circular pieces, which are placed in the metal disks. These are placed upon the mouths of the bottles, (not in them,) and then wired down. Those in use have been found to answer perfectly for quiet liquors. This form does not require a corkscrew: the stoppers placed *in* the bottles are withdrawn with a corkscrew, which enters the wool with more ease, and holds more firmly, than in a common cork. Many modes of forming the sheet rubber were described by cutting leaves or veneers from blocks of solid rubber, which had been formed by mastication in an engine, and then pressed into the form of a block. Of these veneers, 18 inches long and 9 wide, eight or nine weigh a pound, and cost five or six shillings; and Mr. Brokedon particularly recommended these for the purpose of covering pickle and preserve jars, as a substitute for the bladder usually employed—a foul and offensive animal matter, liable to decay, and destroy the things it was intended to preserve: the sheet of rubber, on the contrary, is pure and clean, and may, after washing in warm water, be again and again used. Other modes of obtaining sheet rubber for covering the stoppers were described, viz. by making solutions with naphtha and other solvents thin enough to cast on metal plates or on glass; and with a thicker solution, by rolling out the dissolved rubber into sheets upon cloth previously wetted: when the rubber thus rolled out had sufficiently hardened by the evaporation of the solvent, it could be stripped from the cloth, and when free from any smell left by the solvent, it could be applied to covering the stoppers. The stoppers can be sold at a price per gross less than that of common corks. They are not in the least degree affected by or affect spirits, wine, beer, cider, and common drinks, since neither alcohol nor the vegetable acids have the slightest action upon India rubber: they, with slight pressure, close perfectly air-tight; and they do not fix as glass stoppers do in the decanters.—*Literary Gazette*, No. 1220; *abridged*.

NEW ACID FOR DYEING.

M. Boutin has produced a new Acid from the root of the Aloe by the action of nitric acid; which has a beautiful red colour, and is found to be of great utility to dyers.

BARYTES MANUFACTORY.

In the midst of the Glen of Sannox, Arran, and on the edge of a precipitous rivulet of the same name, has been discovered a rich vein of Barytes. Last year, a manufactory for the article was erected on the spot. The quarry is about 100 yards up the rivulet, whence the ore is brought to the manufactory on a wooden railway. The ore is first washed from any mixture of earth by means of a stream formed by some rude stones placed across a waterfall, and it is then ground into a fine pulp. It is afterwards put into square wooden frames, where it is again well washed; next it is removed to the boilers, where, being mixed with sulphuric acid, it is boiled with steam, and the ferruginous sa[illegible]arises in the process is carefully removed. It

is then run off into troughs, and dried in a drying-house kept at a high temperature, till it becomes so solid that it can be cut into an oblong brick form. It is then removed into a cooler house, where it is dried thoroughly, when it is ready for packing into barrels, or removed to the dyeing-house to be dyed to any shade which may be desired. The machinery erected for the manufactory cost upwards of £3000, and with its aid ten workmen are enabled to turn out four tons of prepared barytes daily. This material is now extensively used, instead of white lead, to form the body of paints, and for many purposes is preferable to that pigment.

OPTICAL GLASS.

M. Bontemps, director of the great glass-houses at Choisy-le-Roi, near Paris, has submitted to the Academy of Sciences, a paper "On the Manufacturing of Flint-glass for Optical Purposes." An historical account was given in this memoir of the efforts of various manufacturers in France and England, and elsewhere, to produce flint-glass free, or as free as possible, from streaks, bubbles, and other defects, for lenses of large dimensions. M. Guinant, senior, succeeded better than any body else in manufacturing glass of this kind; but that gentleman died without having divulged the secret of his process even to his own family. It is known that he used to supply the workshop of the celebrated Fraunhofer, of Munich, with large objective glasses of the greatest purity and value. Still, he had never produced a lens of more than thirty centimeters in diameter. M. Bontemps, having purchased from the heirs of M. Guinant a few imperfect receipts, gave himself up to a long series of experiments, and now communicated the result of his labours to the Academy without any reserve. It appears that the materials used by him are as follows:—Sand, 100 kilogrammes; deutoxide of lead, 100 kilos; subcarbonate of potash, 30 kilos. These produce a flint-glass, the density of which varies from 3·5 to 3·6. The main secret of the proceeding is the stirring up of the fluid vitreous substance while in the furnace—the *brassage*, or brewing of it, as M. Bontemps expresses it—with an earthen cylinder of the same material as the smelting pot. After various precautions fully detailed in the memoir, this cylinder, closed at the lower end, is introduced at a white heat into the metal; and an iron rod, heated red, is then put inside the cylinder, and is made by hand to give the cylinder the proper motion for thoroughly stirring up the fluid mass, the rod being changed from time to time. This takes away all streaks from the glass; and a clever method of suddenly effecting a slight cooling of the furnace, by instantly covering the fire-grate with coal a foot thick, causes all the air-bubbles to rise in the metal and disappear. It is found that, by this process, masses of flint-glass of *any* size may be made, and that all the defects are *driven to one part of the mass*, so that the remainder is exceedingly pure; and, as M. Bontemps says, objective glasses of 50 or 60 centimetres, (from 18 to 24 inches diameter,) may be cut out of them. The ingredients of his crown-glass are, white sand, 100 kilos; subcarbonate of potash, 35 kilos;

subcarbonate of soda, 20 kilos; chalk, 15 kilos; arsenic, 1 kilo.—*Literary Gazette*, No. 1203.

The *Société d'Encouragement* has awarded a prize of 14,000 francs to MM. Guinant, jun. and Bontemps, for their improved manufacture of flint and crown glass for astronomical purposes.

IMPROVED MANUFACTURE OF GLASS.

Messrs. Coutures, of Bourdeaux, have introduced an important improvement into the manufacturing of glass, (black glass,) bottles, by using a flexible tube worked by machinery, for injecting air into the mass of fluid metal which is taken out of the glass pot at the end of the blower's stick. An ingeniously adjusted cock permits the workman to use just as much or as little air as he pleases; and while a considerable saving of labour to the man is effected, the bowl of glass is blown with much greater uniformity.—*Literary Gazette*, No. 1205.

APPLICATIONS OF IRON.

On June 9, Mr. H. Wilkinson detailed to the Society of Arts several remarkable and novel facts respecting Iron,—which has never been so extensively employed as at the present period. We have iron roads and carriages; steamboats; the cushions of our chairs are stuffed with iron, in place of horse-hair: indeed, not only our bedsteads, but even our beds, are made of iron. These are merely mechanical applications of that important metal. When we are told of living animals whose bodies are composed almost wholly of iron, incased in flint, and that these animals feed on plants, have the power of motion, and can live in muriatic acid, it may at first excite a smile of incredulity; nevertheless, Prof. Ehrenberg has discovered that the bog-iron ore, from which the beautiful Berlin castings are made, originates from an animalcule that once had life, the whole mass being composed of the bodies of myriads of these animals; and that the Tripoli or polishing powder, so extensively used in the arts, and in Berlin, to form the casting moulds in the iron-foundries, is entirely composed of the shells of similar animalculæ, capable of bearing a red heat without destroying their outer coating or shell. Dr. Faraday has shewn that iron will remain for months in *strong* nitric acid without the slightest action taking place: he has proved that when chemical action ceases, electrical action ceases also, and *vice versâ*; and has also established that platinum and carbon act as protectors to iron under such circumstances.

Iron, at this time, occupies the attention of scientific men of every country. To the chemist and philosopher it presents many anomalies. Its chemical and electrical properties are at variance with all preconceived ideas. It appears to possess some extraordinary relation to other bodies, which, whenever it may be satisfactorily explained, will open an extensive field of scientific inquiry. Iron exhibits in the most striking manner the phenomena of electricity, in the form termed magnetism; and it has always appeared to Mr. Wilkinson *that the different states of iron and steel depend on electrical causes, modified by the action of*

carbon and oxygen. In the course of Mr. Wilkinson's lecture, he made several amusing experiments. He explained the nature of shot, after having been under water for more than two or three hundred years, becoming almost red-hot when recovered and exposed to the air. He also shewed the varying attraction of the poker to the needle, and the effect of ignition by a tube of glass being filled with metallic lead, hermetically sealed, and when the opposition to air was removed, the contents being sprinkled over a sheet of paper, setting fire to it ; inferring, and very correctly, that if iron, which had been under water during a course of years, could be reduced to such small, such fine particles, it would have the same effect. Mr. Wilkinson concluded the illustration by giving many extraordinary instances of the effects produced on iron by the long-contined action of salt water, and exhibited several specimens of iron which had been recovered after having been immersed in the ocean for years.—*Literary Gazette*, No. 1221 ; *abridged.*

SPONTANEOUS HEATING OF CAST IRON.

Cast Iron, when brought into the air, after it had been for many years under salt and water, has become red hot. Thus, in June, 1836, some cannon balls were raised from the ship, *Mary Rose*, which sunk in a naval engagement near the Isle of Wight, in July, 1545, nearly 300 years before. These balls all became hot on exposure to the air, and fell to pieces. The cast-iron gratings, after being long immersed in the porter-vats in the large breweries of London, grow hot, when the porter is drawn off, from a similar cause.—*Mr. Wilkinson ; Proc. Asiatic Soc.*

STRENGTH OF IRON PILLARS.

Mr. Hodgkinson has read to the British Association a paper relative to a series of experiments made by him on the Strength of Iron Pillars. It appeared from these that a pillar, square at top and bottom, was about three times as strong as one rounded at the ends—that if the pillars were not placed perfectly perpendicular, at least two-thirds of their strength was lost—and that they were one-seventh stronger when swelled in the middle, like the fustrum of a cone with the base in the centre.

TRUE PLANE METALLIC SURFACES.

Mr. Whitworth has exhibited to the British Association two iron plates, to illustrate the improved method of getting up Metallic Surfaces, or rather to shew the result obtained. The practice hitherto has been grinding: filing and scraping are the new modes, especially the latter. On the old plan, the original irregularities were propagated throughout the process; but by covering the surface with colouring matter after planing and filing, the scraping tool, under the direction of an experienced workman, produces a true plane. The plates attracted great attention and praise. When one was placed carefully on the other, they adhered with considerable force; so strongly, indeed, that one could be lifted by the other, and the weight was not

small. But if no care were taken in this experiment, there would be no contact; the upper one would slide off on the film of air, as though there were grease between the plates. A human hair between caused the plates to revolve with the slightest touch, and when one was allowed to fall on the other there was no metallic sound. Mr. Whitworth observed that, possibly, absolute truth was unattainable; the present, however, was an approach to it, but he considered the practical limit not yet reached. Mr. Roberts pointed out the great value to be derived from this new working to solid pistons, &c.

IDENTIFYING DETECTOR LOCK.

MR. PIERCE has patented an improvement upon Chubb's patent lock, which is declared by the inventor to possess, in addition to the most perfect security, a means of identifying any person who attempts to open it by any kind of instrument that can possibly be applied. The combination upon which this security is founded, admits also of such an infinite number of changes, that every lock differs, and can be opened only by its own proper key. Its construction is simple, its parts accurate, its action peculiarly pleasant, and remarkably strong. "Locks, known by the name of Detector Locks," observes Mr. Pierce, "have long been before the public; but as they merely apprize the owner of an attempt having been made, without presuming to identify the guilty one, anxiety and suspicion are the natural results; and not unfrequently have the innocent been made to suffer with the guilty." As a remedy for this evil, the present invention marks the offender with an unexpected stamp, (which cannot be removed for weeks,) and thus detects the perpetrator alone, without the possibility of misleading suspicion.—*Literary Gazette*, No. 1233.

THE AQUATIC LIFE HAT.

THIS Hat is the invention of Mr. White, of Cheapside, who has converted an article of dress into a perfect life buoy. The upper part of the crown of the hat is made air-tight and water-proof, so that in the event of the wearer falling into the water, it will save him by its buoyancy from being drowned, if he only holds it in his hand. It is to be fastened by a small riband to the button-hole of the wearer's coat, in aquatic expeditions, &c. In order to render the hat still more efficacious, and enable it to save more lives than one, the lining is formed so to be capable of being pulled out and inflated by the breath, and then closed at the extremity; in which state it will save several persons in the water.—*Times*, Oct. 8; *abridged*.

UBIQUITOUS CLOCK.

A CLOCKMAKER of Vienna, named Mathias Ratrenhofer, has solved the problem proposed by Prof. Gruithausen, at Munich,—"to construct a clock which shall show at once the time in several cities, the works of which shall not be, in anywise, hindered in their movements, whether they put in motion more or fewer clocks for different places, whether they are in Europe or in the other quarters of the

globe; and the hands of which may be changed at pleasure, and directed to other places." This clock goes right, and its dial-plate, which is 14 inches in diameter, has in the centre the dial for Vienna, and around and radiating from it, seventy-two cities of different parts of the world, each with its own dial, and the name of the place. It shows the difference of mean time between Vienna and the seventy-two other towns, and is set in motion by a 4lb. weight only: all the other clocks, however, are set in motion by the centre of the Vienna clock; so that if the works stand still, nothing more is necessary than to set the Vienna clock, to make all the other clocks indicate the true time. Ingenious as this piece of mechanism may be in its construction, Prof. Gruithausen has, however, endeavoured to show that this clock is not what he intended.—*Literary Gazette*, No. 1200.

A MODEL OF HOBART TOWN

Was among the sights of London during the season. It was more than 1000 square feet in extent, and on the scale of 20 feet to an inch; so that every object was not only distinctly indicated, but represented. The streets at right angles, the public buildings, the country around; the rivers, with wharfs; high grounds, with windmills; and mountains covered with snow; were all laid down with extraordinary minuteness. Mr. G. Peck, who has executed this work, is stated to be a native of Hull, and to have spent several years in Australia.

NEW INSTRUMENTS FOR THE EAR AND EYE.

Mr. J. H. Curtis has lately exhibited to the London Medical Society, two new Instruments, which he brought with him from the Continent. The one is an *Auriscope*, which, by the aid of a lamp and condensing lens, enables the practitioner to examine the internal ear with great facility, and minutely to observe its condition. The other instrument is remarkably curious: it is the invention of Dr. Jager, the oculist, of Vienna, and is called *a Phantom*: by its means, every kind of operation on the eye may be performed, either on a dead subject or any animal, just as if it were in the living head.—*Literary Gazette*, No. 1239.

MERCURIAL LETTER-GAUGE.

This elegant apparatus is quite worthy of its inventor, Mr. Osler, the ingenious constructor of the Anemometer. In a small upright glass-tube, on a stand, is a quantity of mercury, into which is plunged a graduated ivory column, marked ½oz., 1oz., 1½oz., 2oz., &c., with a convenient table on the top, to receive the letter to be weighed. According to its weight, the column descends, and the mercury rises, indicating in a moment the exact weight of the letter.

NEW MINER'S LAMP.

Mr. Clegg, near Oldham, has constructed a Miner's Lamp, the model of which has been much commended by the British Association. It is upon the principle of Davy's, but is incl[illegible] triangular

lantern, with three bull's-eye glasses. The object is to get rid of the danger arising from the use of Davy's, which, should it fall or upset, lets the flame through the wires, and causes an explosion. In this lamp, such danger is obviated, as there is gauze on the air-holes of the lantern; and it has this excellent property, that whenever there is danger, the light goes out.

PURIFICATION OF LAMP OILS.

THE chief objection to the employment of the common fish oils for burning in lamps and other purposes, is their disagreeable odour, and this is frequently not in proportion to their other qualities. Pale seal oil, for example, is, in general, very transparent, and burns well, although its odour is often almost intolerable. Several years ago, Dr. Davidson, of Glasgow, noticed a process by which the most putrid fish oils may be deprived of their fetid odour: and many experiments since made with dog-fish oil, &c. of an extremely putrid odour, have tended to confirm these results. The process is cheap, and consists of the use of chloride of lime. This agent does not seem to possess the property of depriving, to any extent, fish oils of their proper or natural odour; as, for example, it has little effect upon fine sperm oil, but its operation seems to be chiefly confined to the removal of the fetor, which is the result of putrefaction. Hence, the more fetid the oil, the greater will be the change effected by the process. The quantity of chloride of lime required varies according to the putridity of the oil; but, in general, 1lb. of it is sufficient for 112lbs. of oil; though, if the oil be excessively putrid, 1½lb. or 2lb. may be required.

The process is as follows:—Take 1lb. chloride of lime, and about twelve times the quantity of water. Triturate the chloride of lime in a mortar, or similar apparatus, gradually adding a portion of the water, so as at first to form a smooth and soft paste, and then the remainder, which will give the whole the consistence of cream. The object of this trituration is to break down every particle of the powder, so that it may be capable of combination with the oil. Mix this thoroughly with the oil by frequent and careful stirring. Let them remain for a few hours; when add 1lb. sulphuric acid, previously diluted with 20 or 30 parts of water, and boil, with a gentle heat, constantly stirring during the process, until the oil drops clear from the end of a piece of wood to be dipped into it. After the boiling has been finished, allow the oil to settle for a few hours; then draw it off from the acidulated water. A common cast-iron boiler, lined with lead, is best adapted for this process, as being less acted on by the chloride of lime and acid; but a copper or iron vessel will answer the purpose, if the quantity of acid be not too great. For the trituration of the chloride of lime, however, mortars of iron or copper should be avoided. Fish oil treated in this manner seems to burn equally well as the same oil which has not undergone this process; and a very ready and convenient method of trying it is with a floating-light.—*Jameson's Journal*, No. 55; *abridged*. (This process has become a

very valuable one from the recent high price of sperm oil, for which common fish oils, purified as above, are now largely substituted, at nearly one-fourth of the cost.)

INDIAN PERFUMED OILS.

Dr. Jackson, of Ghazeepoore, states that in manufacturing the Perfumed Oils of Jasmine and Bela, the natives never make use of distillation, but extract the essence by causing it to be absorbed by some of the purest oleaginous seeds, and then expressing these in a common mill, when the oil given out has all the scent of the flower made use of. The plan adopted is to place on the ground a layer of the flower, about 4 inches thick and 2 feet square, over which is put some of the Tel or Sesanum seed wetted, about 2 inches thick, and 2 feet square; on this again is placed another layer of flowers, about 4 inches thick, as in the first instance; the whole being covered with a sheet, which is held down by weights at the ends and sides. In this state, it is allowed to remain from twelve to eighteen hours; after which the flowers are removed, and others placed in the same way; this is also a third time repeated, if it be desired to have the scent very strong. After the last process, the seeds in their swollen state are placed in a mill; the oil is then expressed, and possesses more fully the scent of the flower. The oil is kept in prepared skins, called dubbers, and is sold at so much per seer. Distillation is never employed in preparing this oil, as it is with that from roses, for the extreme heat, (from its being in the middle of the rains, when the trees come into flower), would most likely carry off all the scent. The Jasmine, or *Chymbole*, as it is called, is used very largely among women, who daily smear the head and body with it.—*Jameson's Journal*, No. 57; *abridged*.

ISINGLASS FROM INDIAN FISH.

A product of India, the Suleah Fish, which abounds in the rivers that intersect the Sunderbunds, and in the estuaries of Bengal, has been found to possess a property from which Isinglass has been manufactured under a monopoly raised by the Chinese, and which has hitherto escaped the observation of the European speculators.—According to the description afforded, the Suleah attains a large size, weighing, in some cases, 1 cwt. and upwards. It may be taken all the year round, and large quantities of it are brought up in boats to Calcutta, where it is cured, and thence conveyed inland, where it is chiefly consumed as food by the poorer classes. The discovery that isinglass could be made from the air-bladders of the Suleah was accidental; when they were found to resemble dull amber, exceedingly hard and pellucid, and closely resembling the book isinglass of commerce. The experimenter had a portion of one of them cut off and boiled in clear tank water, strained off, and placed in a cool atmosphere; and, next morning, it turned out firm and translucid isinglass. Satisfied that the discovery was a valuable one, the experimenter submitted the further working of it to an eminent chemist at Calcutta, who having

cleansed it, by the help of a Chinese shoemaker, cut it into fine threads, when it equalled, in every respect, any isinglass in the market. On further inquiry, it was ascertained that the Chinese had a monopoly arising out of the Suleah fishery; that not one fish out of a thousand that came into the market ever contained its bladder, but that they were taken out by the fishermen as soon as the fish were caught, and handed over to the Chinese contractors.—*Abridged from the Times*, Sept. 24.*

GAS-LIGHTING LONDON.

For lighting London and its suburbs with Gas, there are eighteen public gas-works; twelve public gas-work companies; £2,800,000 capital employed in works, pipes, tanks, gas-holders, apparatus; £450,000 yearly revenue derived; 180,000 tons of coals used in the year for making gas; 1,460,000,000 cubic feet of gas made in the year; 134,300 private burners supplied to about 400,000 customers; 30,400 public, or street, consumers; about 2,650 of these are in the city of London; 380 lamplighters employed; 176 gas-holders, several of them are double ones, capable of storing 5,500,000 cubic feet; 890 tons of coals used in the retorts, in the shortest day, in twenty-four hours; 7,120,000 cubic feet of gas used in the longest night, say 24th December; about 2,500 persons employed in the metropolis alone in this branch of manufacture: between 1822 and 1827, the consumption was nearly doubled; and, between 1827 and 1837, it was again nearly doubled.—*Mr. Hedley, Engineer of the Alliance Gas Works, Dublin.*

HEATING BY GAS.

It is greatly to be feared that the health of the public is frequently sacrificed in what are falsely termed improvements "upon scientific principles." Such we take to be the case with "Gas stoves," or stoves for applying carburetted hydrogen and pure hydrogen gases to the purposes of warming buildings. Sir John Robison, in a paper read before the Society of Arts for Scotland, March 13, 1809, observes: "The various forms of stoves have been proposed, on the understanding, it would appear, that, by applying the 'flame of the gas' to metallic bodies, an increased degree of heat would be communicated by them to the atmosphere around. A little consideration will show, that however the *distribution* of heat may be modified by such contrivances, there can be no increase of the heating power; and that when a certain measure of gas is fairly burned, the heat evolved into the apartment will be the same whether the flame be disposed as a light, or made to play against metallic plates or other combinations of apparatus. In all cases where the products of the combustion are allowed to mix with the atmosphere of the apartment, without provision being made for carrying them off by ventilation, the effects of such processes must be more or less deleterious to health, according to the proportion these products bear to the mass of air they mix in. On the whole, it may

* The result of Dr. Cantor's examination of the Suleah before the Zoological Society, will be found in the Year-book of Facts, 1840, p. 205.

be assumed, that this mode of heating apartments is the most expensive, the least efficient, and, excepting that by Joyce's charcoal stove, the most insalubrious that can be resorted to."—*Popular Errors*, Part II.

ECONOMY OF GAS-BURNERS.

It is very generally believed by workmen and others, that the more freely the current of air is admitted to an Argand Gas-burner, the better will be the light; and hence the burners of glass chimneys in ordinary use are made in such a way as to favour this view. No practice, however, can be more incorrect, or can lead to less economical results. An attentive observation of what takes place will show that *there is only a certain proportion of air required for the favourable combustion of a definite measure of gas.* If more air than this due proportion be allowed to pass up the chimney, the size of the flame will be reduced, and the quantity of light diminished: if, on the other hand, less than the due proportion be admitted, the surface of the flame will be increased by elongation; but it will become obscure, and the quantity of light will decrease, owing to the escape of particles of unconsumed carbon.—*Sir John Robison.*

With respect to the economy of street lights, it may be mentioned that the large bat-wing, so much used in large public lamps, is wasteful, smokes the lantern, and does not give light in proportion to its expenditure.—*Popular Errors*, Part II.

SMOKE FROM GAS-LIGHTS.

It is pretty generally imagined that the smoking of ceilings is occasioned by impurity in the Gas, whereas, in this case, there is no connexion between the deposition of soot and the quality of the gas. The evil arises either from the flame being raised so high that some of its forked points give out no smoke, or more frequently from a careless mode of lighting. If, when lighting the lamps, the stopcock be opened suddenly, and a burst of gas be permitted to escape *before* the match be applied to light it, then a strong puff follows the lighting of each burner, and a cloud of black smoke rises to the ceiling. This, in many houses and shops, is repeated daily, and the inevitable consequence is a blackened ceiling. In some well-regulated houses, the glasses are taken off and wiped every day, and before they are put on again, the match is applied to the lip of the burner, and the stopcock cautiously opened, so that no more gas escapes than is sufficient to make a ring of blue flame; the glasses being then put on quite straight, the stopcocks are gently turned, until the flames stand at three inches high. When this is done, few chimney-glasses will be broken, and the ceilings will not be blackened for years.—*(Sir John Robison.)*—*Popular Errors*, Part II.

HEATING BATHS BY GAS.

Dr. Andrew Fyfe, in a valuable paper read before the Society of Arts for Scotland, on March 11, suggests an application of Gas as a

source of heat, which he believes not to have been hitherto put in practice—namely, to heating water for a Bath.

By the consumption of a foot of gas, one gallon of water may be raised from 50° to 100°, or a few degrees above it. A slipper bath holds in general from 20 to 30 gallons. In his trials, Dr. Fyfe used a bath, into which were put 24 gallons of water at 50°; beneath the bath, and at a little distance from it, there was passed a tube of about 2 inches diameter, having six rose-jet burners attached to it. The gas was kindled, and in three quarters of an hour the whole was brought to 1000°. The gas consumed was 17 feet; at a cost, therefore, of nearly 2d.

Dr. Fyfe considers this as a far superior method to the heating of baths by burning a small fire-place within the bath; for, in this case, there must be a tube conveyed to a chimney, to carry off the smoke, a part of which, however, often escapes into the apartment; besides, owing to the great heat immediately over the fire, the water there becomes very warm, and gives off a great deal of steam, which is not the case with the gas, the heat being uniformly applied under the water. Dr. Fyfe does not recommend this as a method for heating baths for general use; but where a bath is required, as in a bed-room, he considers it an easy and convenient means of procuring one. All that is necessary is to attach a flexible pipe to a tube in the room, and to take care that it is of such a size that it will supply gas to the extent of from 30 to 40 feet per hour, according as the bath may be required. Six rose-jet burners, with 16 holes each, will be sufficient; for each of these will burn about 8 feet per hour.

Instead of the common bath, Dr. Fyfe had one constructed with a tube passing through the water, and through which the products of combustion passed, but he did not find much advantage from its use. The Doctor, however, recommended that, instead of having a flat bottom, as usual, the sides of the bath should be extended downwards, and made to contain water, so as to prevent loss of heat by radiation. Some persons may object to the use of gas in a bed-room, owing to the production of carbonic acid; but their fears, on this account, are groundless. Suppose that 40 feet of gas are contained, and that the whole of the products of combustion escape into the apartment; these will, on an average, yield less than their own bulk of carbonic acid gas, which, when diluted with the air of the apartment, will be too small to have any injurious effect on the system.—*Jameson's Journal*, No. 58; *abridged*.

NEW PRODUCTS FROM BITUMEN.

On June 1, M. Dumas read to the Academy of Sciences, at Paris, a report on M. Selligue's method of extracting bituminous oils and other products from certain schistose rocks, and applying these products to the furnishing gas for lighting. The principal rocks worked by M. Selligue are at St. Léger-Igornay, and Surmoulins, near Epinal and Autun, in the Saone et Loire: three manufactories are

established there, and produce 2000 kilogrammes of bituminous oil a-day. The total number of various products extracted from the rocks, and serviceable for gas, are five: besides these there is a bituminous matter, applicable instead of grease to the wheels of carriages; another is good for all purposes of bituminous paving, &c.; another substance suffices as a vehicle in the composition of dark-coloured varnish; and, last of all, a white waxy matter is extracted, which has been formed into tapers, and a good kind of candle. The strata of these bituminous slates are found to yield from 10 to 50 per cent. of oily substances, more or less combustible; but the gas is produced only from the oil in its purest form. It has been discovered by M. Selligue, that carbonic acid gas is endowed with great combustibility when mixed with other gases—a fact generally doubted; and it has also been found that a gas, yielding a very bright light, is formed by mixing the gases coming from the bituminous oils with those resulting from the decomposition of water. This latter kind of mixed gas is produced very cheaply, and is not affected by cold at 50 degrees below zero, centigrade. Dijon, and the suburb of Paris called Les Batignolles, are already, in great part, lighted with gas made according to M. Selligue's plan.—*Literary Gazette*, No. 1221; *abridged.**

ANIMAL GAS.

M. SEGUIN has succeeded in drying the muscles of animals by the action of heat, in closed cylinders, so as to admit of their being kept in store-houses with very little annoyance from the effluvium: he then employed a slight steam condensation, jointly with washing and purifying the muscle, by saturated solution of chlorure of calcium, and he has thereby preserved to the gas which he extrated all its illuminating powers, while he has completely separated it from the ammoniacal salts that might render it fetid, by converting them direct into hydrochlorure of ammonium. Such gas, thus purified, has been found to contain about 10 grammes of empyreumatic vapours per cubic metre; and its illuminating power is such, that during one hour twenty-two litres of this gas will give as much light as a good Carcel lamp. The empyreumatic vapours are not found to be condensed by low temperature, but may be liquefied by compression; and these produce a fluid resembling ether, burning with a fuliginous flame, but without any odour. M. Séguin's results may be tabularized as follows:—

One horse, average weight 220 kilogammes,
gave Gas.. 25682 litres, or light for 411 hours;
Sal Ammoniac.... 18·5 kilogrammes.
Ivory Black ..... 21 kilogrammes.

Value of gas at 5 centimes per hour	20f.	55c.
Ditto of Sal Ammoniac.....	56	50
———Ivory Black	3	15
Total value.....	80fr.	20c.

Now, the average price of such an animal for killing, or dead, is 17fr.;

* See also, Year-book of Facts, 1840, p. 154.

the labour, &c. of extracting these matters, cost 4f. 25c.; cost of various accessory materials, 2f. 70c.; fuel, 1f. 60c.: total, 25f. 55c. The ordinary knackers of Paris never get out of the parts from which the gas is thus produced more than about 5fr. worth of grease; and since Paris furnishes annually from 15,000 to 16,000 dead horses, the value of this method may be easily ascertained. If to this be added the gas that may be obtained from the bodies of other animals, and from refuse animal matter in the capital, the total quantity to be derived from these hitherto neglected materials will be found to be immense.—*Literary Gazette*, No. 1210; *abridged.* *

SPONTANEOUS COMBUSTION.

THE recent mysterious fire on board the Talavera, at Devonport dockyard, and the probable origin of it from the spontaneous ignition of oily substances mixed with tow and carbonaceous matter, have directed attention to the circumstances in which combustion takes place from the decomposition of such materials. It is a fact, however, better ascertained than can be accounted for, that fixed oils, when mixed with any light kind of charcoal, or substances containing carbon, such as cotton, flax, or even wool, which is not of itself inflammable, heat by the process of decomposition, and after remaining in contact some time, at length burst into flame. This Spontaneous Combustion takes place in waste cotton which has been employed to wipe machines, and then thrown away and allowed to accumulate into a heap. We have known an instance of the kind in a manufactory for spinning worsteds, where the waste wool, or "slubbings," as it is termed in Yorkshire, was thrown into a corner and neglected. It then heated, and was on the point of bursting into flame, when the attention of the workmen was directed to the heap by the smoke and smell. In cotton-mills, the danger exists in a still greater degree, and it is believed that the destruction of many cotton factories has been occasioned by this means. The cause of this peculiar property of fixed oils deserves more attention than has hitherto been paid to it. If the fire at Devonport can be satisfactorily traced to this origin, it will be the means of setting on foot chemical inquiry into a subject of much interest; and may, perhaps, tend to elucidate some of the hidden phenomena respecting combustion that are at present in obscurity.—*Inventors' Advocate.*

SECURITY FROM INTENSE HEAT.

STRANGERS on visiting a glass-house universally wonder at the possibility of the workmen existing in a situation in which their clothes are continually scorched, whilst their naked skin exhibits no marks of the effects of the fire. Mr. C. T. Coathupe, from a series of experiments † made to ascertain the cause of this anomaly, infers that the copious perspiration which exudes from the skin of glass-makers, and of those who are engaged in similar scorching occupations, is a suf-

* See also, Year-book of Facts, 1840, p. 120.

† Communicated to the Philosophical Magazine, No. 103.

ficient protection from the burning effects of a dry atmosphere of from 300 to 400 degrees of Fahrenheit; and that whilst the clothes of such persons are burning to tinder, their skin may be rendered insensible to the direct effects of fire upon the inanimate matter around them, by simple natural laws, viz. those of evaporation.—*Popular Errors*, Part II.

HEAT FROM COAL AND COAL-GAS.

It is generally allowed that one pound of Coal will evaporate about 14 lbs. of water, supposing all the heat evolved were applied. From the experiments of Despretz, it is concluded that, by the combustion of 2lb. of pure carbon, 12·3lb. of water will be evaporated. The superior evaporative power of coal must, therefore, be owing to the bituminous matter which it contains, which bitumen is the source of the gaseous matter evolved when the coal is heated: hence the necessity, when using coal as fuel, of so burning it, that the whole of the gaseous matter evolved during the heating of the coal shall be consumed; for where any part of it escapes combustion, the loss is considerable. Now, one gallon of water may be boiled off by the consumption of about from 17 to 20, say, on an average, 18 feet of gas. The quantity of gas which coal affords varies much, according to its quality: of course, the quantity of coke or carbon which coal will leave, after being deprived of its gaseous ingredients, must also vary. It is generally allowed that one pound of coal will, on an average, yield about 5 feet of gas, which, at the rate above stated, will evaporate rather more than one-fourth of a gallon, that is, 2½lb.; but, in addition to the gas which is collected by the decomposition of coal, a large quantity of tar and volatile oil is set free, all of which also give forth much more heat during their combustion; and hence it is, that the more perfect the combustion of coal the greater is its evaporative power; for, while the whole of the coke, which is a fixed principle, is always consumed, with the exception of the cinder, yet more or less of the volatile gaseous matter may escape; and, as these generate a great deal of heat during the combustion, the loss becomes great when much of them is allowed to fly off unburnt.—*Dr. Fyfe, in Jameson's Journal*, No. 58.

IMPROVEMENT IN ARGAND GAS-BURNERS.

In the common Argand burner, the holes in the top through which the gas issues for combustion, are perforated *vertically*, and, consequently, the flame rises perpendicularly from the burner. Mr. B. Cooke, of Birmingham, has patented an improvement, which consists in drilling or perforating these holes at any convenient angle, 20, 30, or 60 degrees from the axis of the burner. The advantage of this change of position is stated to be, that the gas being forced through the holes drilled at the sides of the burner, instead of through holes at the top of it, passes into and through a larger portion of atmospheric air, obtaining more oxygen, and necessarily a greater illumi-

nating power, than when burnt with the common Argand burner.—*Mechanics' Magazine*, No. 864.

IMPROVED GAS-METER.

In the ordinary Gas-meter, originally invented by Mr. Glegg, there are the following defects: a variation in the quantity of water the meter ought to contain; the freezing of the water in severe weather; and the corrosion or destruction of the metals, from the voltaic or chemical action that ensues, when different metals are exposed to a liquid containing alkaline or other impurities.

Mr. Hemming has overcome these defects by the construction of a Gas-meter, which he has patented. It is provided with a small cistern, containing water to supply any loss in the meter by evaporation, or from other causes. By a simple apparatus, unencumbered with valves or cocks, the water from the cistern immediately enters the meter, if there be the least deficiency, and ceases to flow the instant the true water-line is attained; while, to guard against any excess of liquid, by a peculiar contrivance, the slightest additional quantity is immediately discharged into a separate receptacle. The metals are protected from chemical or voltaic action, by pieces of zinc soldered on to different parts of the meter. The zinc thus attracts all those impurities which dissolve or corrode other metals less oxidizable than itself. This protection of the vital parts of the meter by zinc, enables the patentee to employ, in lieu of water, a saline solution, which does not freeze until cooled below the lowest temperature it is subject to in Britain.—*Abridged from the Morning Advertiser.*

COOKING BY GAS.

It appears to have occurred, about the same period, to the late Dr. Duncan and Sir John Robison, that, by passing a current of gas, mixed with atmospheric air, through a wide vertical tube, having its upper end covered by a diaphragm of wire-gauze, and by kindling the mixture as it escapes through the interstices of the wire cloth, a convenient stove might be formed for culinary purposes. Dr. Duncan applied some small apparatus on this principle to pharmaceutical operations in his class-room; and Sir John Robison had his kitchen furnished with a range of large stoves, which were intended to supersede the use of charcoal stoves in various culinary purposes. In both cases, the success has been perfect; and the same principle has since been adopted advantageously in a variety of processes in the useful arts. The form of the apparatus may be varied so as to suit the process to which it is to be applied: all that is essential is, that a current of the mixed gas and air shall rise through the wire-cloth, and that the proportion of gas to atmospheric air shall never be so great as to allow of the flame becoming yellow; for, with this precaution, the combustion of the carburetted hydrogen will be complete, and no deposit of soot will take place on cold bodies when set over the flames: the proper quantity of gas in the mixture being easily determined by the stop-cock belonging to each stove.

For ordinary purposes, the cylinders may be 30 inches long, and three to four inches diameter, and the wire-cloth for the tops should have about thirty wires to the inch. That which is manufactured for safety-lamps answers well for this purpose.

Whenever a hole takes place in a diaphragm, it is no longer possible to use it; else when lighted, the flame will pass through the fracture, and communicate with the jet at the bottom of the cylinder, which will then burn and blacken, like an ordinary gas light. With care, the wire-gauze will last, in daily use, for some months; and if covered by a layer of coarse sand, or pounded limestone, the gauze will continue serviceable for an unlimited period.

When more intense heat is required than is attainable by the unaided combustion of the mixed gases, recourse may be had to various forms of blow-pipes; and when a large volume of such flame is to be employed, the current of atmospheric air may be urged by double bellows. A very efficient apparatus on this principle is to be seen in the laboratory of Dr. D. B. Reid — *Abridged from Jameson's Journal*, No. 56.

IMPROVEMENT IN THE ARGAND LAMP.

Sir John F. Herschel has, for some years, employed the following simple, easy, and unexpensive mode of greatly improving the quantity of light yielded by a common Argand burner. It consists in merely elevating the glass chimney so much above the usual level at which it stands in the burners in ordinary use, that its *lower* edge shall clear the *upper* edge of the circular wick, by a space equal to about a fourth part of the exterior diameter of the wick itself. This may be done to any lamp of the kind, at a cost of about six-pence, by merely adapting to the frame which supports the chimney four pretty stiff steel wires, but in such a manner as to form four long upright hooks, in which the lower end of the chimney rests; or, still better, if the lamp be so originally constructed as to sustain the chimney at the required elevation without such addition, by thin laminæ of brass or iron, having their planes directed to the axis of the wick. The proper elevation is best determined by trial; and as the limits within which it is confined are very narrow, it would be best secured by a screw motion applied to the socket on which the laminæ above-mentioned are fixed; by which they and the chimney may be elevated or depressed at pleasure, without at the same time raising or lowering the wick. Approximately, it may be done in an instant, and the experiment is not a little striking and instructive. Take a common Argand lamp, and alternately raise and depress the chimney vertically from the level where it usually rests, to about as far above the wick, with a moderately quick but steady motion. It will be immediately perceived that a vast difference in the amount of light subsists in the different positions of the chimney, and that a very marked and sudden *maximum* occurs at or near the elevation designated in the commencement; so marked, indeed, as almost to have the effect of a flash, if the motion be quick, or a sudden blaze, as if the wick-screw had been raised a

turn. The flame contracts somewhat in diameter, lengthens, ceases to give off smoke, and attains a dazzling intensity. With this great increase of light, there is certainly not a corresponding increased consumption of oil. This improvement has been communicated, by Sir John F. Herschel, to the *Philosophical Magazine*, No. 102. It is certainly a valuable suggestion: and it is surprising that the glass chimney has not hitherto been placed *above the level of the wick* in the Argand burner, seeing that this plan has been adopted in the majority of lamps invented since the Argand. In the Liverpool lamp, introduced nearly twenty-five years since, for burning seal oil, the chimney was placed similarly to Sir John Herschel's improvement; as well as in the lamps manufactured for burning cocoa-nut oil, naphtha, &c. Many of the French lamps, in which filtered vegetable oils are consumed, are constructed as above; as are also several "reading lamps" common in our shops.

In reply to Sir John Herschel's communication, a paper has appeared in the *Philosophical Magazine*, No. 107, by J. C. Holthouse, Esq.; the observations in which are mostly corroborative of Sir John Herschel's suggestions. Among Mr. Holthouse's results of several experiments with chimneys of various lengths, he has ascertained a seven inch pillar for an Argand burner of the ordinary size to be well adapted for giving brightness, and, at the same time, steadiness, to a flame. The best diameter of the pillar of the chimney Mr. Holthouse considers to be one inch and an eighth. The base of the chimney may be an inch and three-quarters or two inches in diameter, and its shoulder should form a right angle with the level of the burner, half an inch above it. By this it will be seen that the chimneys with rounded shoulders are preferable to those cylinders of uniform diameter from end to end: and Mr. Holthouse has proved the above to be a form of chimney well fitted for giving a degree of light very superior to what is seen in Argand lamps having the ordinarily sized chimneys.

Mr. Holthouse has also examined the question as to the increased consumption of oil, by the following experiment. Two Argand lamps, having wicks and chimneys of the same diameter and length, and furnished with the same kind of oil, were placed in a pair of scales, and at an equal distance and elevation from the centre of a sheet of white paper pasted on the wall. On being lighted, the flames were regulated till the shadow cast by a small ruler had an equal depth; which being fairly determined, weights were put into the stand containing the lighter lamp, till the two exactly balanced each other. The chimney was now quickly removed from one of the lamps, and another substituted for giving a clear white flame, the time being at the same moment noted: they were allowed to burn for forty-two minutes, and were then simultaneously extinguished. At the expiration of this time, the lamp burning with the bright flame had consumed 100 grains more than the other. The experiment being repeated, but with smaller flames, the increased consumption of oil in the brightly burning lamp was 50 grains. Whether this greater expenditure of oil is balanced by the increased degree of illumination, Mr. Holthouse had not determined at the date of his communication.

PROPOSED IMPROVEMENT IN LIGHT-HOUSES.

CAPTAIN BASIL HALL, R. N., has communicated to the *United Service Journal*, No. 143, an important and interesting paper on "Some experiments made with the view of increasing the Brilliancy of Light-houses." The Captain commences by explaining the difference between a revolving and a fixed light-house to be, that, in the former, the rays from the lamp, or lamps, are concentrated into a certain number of portions, say four or five; which accumulated or condensed portions possess, of course, a greater degree of brilliancy than if they were dispersed uniformly round the compass. In the French light-houses, on M. Fresnel's plan, of the first class, the light, which is derived from one immense central lamp, furnished with four concentric wicks, is concentrated, by eight large polyzonal lenses, into as many pencils or portions of rays, each having a divergence of about 6°. The effect of this arrangement is to illuminate, very brilliantly, eight different parts of the horizon, each being about 6° in breadth, while all the rest of the circuit is left in total darkness. Thus, while about 48°, or say 50°, of the horizon are lighted up, the remaining 310° must be left without any rays at all from the light-house, the whole being concentrated and directed towards those eight small spaces only. By the slow rotation of this system of lenses, every portion of the horizon comes, in succession, to have the concentrated light refracted to it through the lenses. This is the revolving light of the French, on the dioptric, or refracting system.

If, instead of lenses, a number of sets of Argand lamps, with parabolic reflectors, be placed on the sides of a revolving apparatus, a series of spaces in the horizon would, in like manner, be lighted up in succession, with a degree of brilliancy proportionate to the number of lamps placed on each face — while all the rest of the circuit would, as before, be left in darkness. This is a description of the ordinary revolving lighthouse of the English, on the reflecting or catoptric plan. Of these there are several varieties, depending on the velocity of the rotation or the colour of the light, and on other circumstances.*

The great desideratum is how to acquire for a fixed lighthouse the same degree of brilliancy, without intermission, from whatever quarter

* The following memorandum shows the relative power, or brilliancy, of the dioptic, or refracting method, of concentrating the light used by the French, compared with the catoptric, or reflecting method, generally used in England. It further points out the enormous superiority — so far as brilliancy is concerned—of a revolving lighthouse, over that emitted from one that is fixed—the reason of which I have already explained.

The maximum effect of the revolving light, on M. Fresnel's principle, that is, of a lighthouse fitted with his great lenses, has been ascertained to be equal to the light of 3150 Argand lamps.

In a revolving lighthouse of the first class in use in England, that is to say, having in each of the four faces six lamps, furnished with parabolic reflectors, the power of the light sent off to the horizon, as the lighthouse revolves, is, at its maximum, equal to that of 21,000 lamps.

But when we come to the powers of a fixed light the falling off is immense. The effect of an Argand lamp, placed in the focus of a parabolic reflector, and viewed in the direction of its vertex, or at its maximum of brilliancy, is only

it be viewed, that a revolving lighthouse does when each of its concentrated pencils of rays falls successively upon the eye. Hitherto this problem has baffled even the ingenuity and resources of Fresnel.

It occurred to Captain Hall whether, if a light were made to revolve rapidly instead of slowly, such a degree of continuity might not be obtained as to give, to all sense, the appearance of a fixed light, which should be equally and constantly visible in every direction round the horizon, so as to exhibit, permanently, that brilliancy which an ordinary revolving lighthouse gives only in flashes.

From the familiar experiment of whirling a lighted coal round the head, as well as from the more elaborate experiments of Professor Wheatstone and others, it was well known that the continuity of light alluded to might be obtained—but, then, two practical questions of some importance arose. First, whether or not the degree of velocity requisite to produce an apparently continuous light could be obtained by the rotation of any system of lenses of the size and weight suited to lighthouse purposes? and secondly, whether, supposing such velocity to be practicable, there might not be such a diminution of the light, caused by this quick rotation, as to render the method of obtaining fixed lights useless in practice?

It was imagined by some persons that if a lighthouse, fitted with eight lenses for instance, were put into such rapid revolution as to bring the flashes emitted by them in quick enough succession on the eye to produce the appearance of continuity, the effective brilliancy might be lessened by the admixture of an equally quick succession of the eight dark spaces in the circuit. For, said they, it must be recol-

equal to that of 350 lamps! So that, at the very best, a fixed lighthouse can never show more than one-sixth as much light as one that revolves on the English system, nor more than one-ninth as much as one that revolves, and is furnished with lenses, on the French system. This prodigious difference in the brilliancy of revolving and steady lighthouses is not matter of speculation, but of direct experiment, and is only too well known to navigators.

In speaking of the effect, or power, of a reflector, in a fixed lighthouse on the English plan, I must beg leave to recall to the reader's recollection that in such a lighthouse the intention of illuminating the whole circuit of the horizon is, at best, imperfectly accomplished, inasmuch as the whole number of lamps and their reflectors, say twenty-four, must be so distributed as to afford each degree of the compass, as nearly as possible, the same amount of light. Now, it unfortunately happens that when a lamp, placed in the focus of a parabolic reflector, is viewed from any direction but from the point exactly opposite to it, that is, in its vertex, a great loss of light takes place.

Suppose the light of such a lamp in the focus of a reflector, when viewed in its vertex, to be equal to 350 lamps:

But the light when viewed	2°	on one side of the vertex of the reflector, it is equal only to							335	lamps
"	3°	"	"	"	"	"	"	"	255	"
"	4°	"	"	"	"	"	"	"	150	"
"	5°	"	"	"	"	"	"	"	60	"

So that, if twenty-four lamps, in the foci of so many reflectors, be ranged round a lighthouse, only twenty-four separate points of the horizon can by possibility enjoy a light equal to that of 350 lamps, while all the rest of the circuit must enjoy less in proportion to their distance from the vertex.

lected that the eight lenses illuminate only about 50 degrees of the horizon, while they leave 310 degrees in darkness.

On the other hand, it was conceived by persons who had experimented on the duration of impressions made on the eye, that the sensibility of the retina might be so augmented and kept in activity by the irritation of constantly recurring flashes, that no loss, or no great loss, of apparent intensity would result from the successive interposition of the dark spaces occurring between the flashes.

[Captain Hall then describes the construction of the apparatus he employed, after which he thus proceeds.]

In the first place, it was clearly established, that when the light-house carrying 8 lenses made 40 revolutions in a minute, the velocity was sufficient to produce to the sense of sight a perfectly continuous light. It must be understood, that when this light was viewed from the short distance of 345 feet, though it was quite continuous, it was not by any means steady, but trembled violently. I have no doubt, however, from the previous experiments which I made with the same apparatus at Portsmouth, that, at distance greater than a quarter of a mile, the light produced by this degree of rapidity in the revolution of the 8 lenses would appear quite as steady as that of a star of the first magnitude, which, it may be observed, though it twinkles, is quite continuous in its effect—just as the light of a candle is continuous, though it be waved about from side to side.

When the lighthouse made 60 revolutions in a minute, or once in a second, the light certainly appeared more steady, but it was not more brilliant; and it would seem from this, that a greater rapidity of rotation than is just necessary to produce apparent continuity does not add to the brilliancy of the light.

CLARIDGE'S PATENT ASPHALTIC MASTIC COMPOSITION.

THIS invention consists in the combination by heat of two substances into a Mastic Cement or Composition: one substance being a natural compound, consisting principally of carbonate of lime and bitumen, with a small portion of aqueous and other matter, and commonly known by the name of *asphalte* or *asphaltos* or *calcareous asphalte*, *asphaltic mineral*, or *asphaltic rock*, or *asphaltic stone*. It is found at Pyrimont, near to Seyssel, in the department De l'Ain, in the kingdom of France, and in other parts of the Jura Mountains, and in other places, in great abundance. The other substance is bitumen or mineral or other pitch.

To make the composition the patentee directs you to proceed as follows:—Take the asphalte in its native state, as it is extracted in masses from the mine, and reduce it to powder: this may be done solely by mechanical means, but the process is much facilitated by heat, by placing the masses in a furnace or oven, the bottom of which is made of plate-iron; in about half an hour, by the application of a brisk fire, the asphalte falls, or is readily reduced to powder. The asphalte is then passed through a sieve, the meshes of which are about one-fourth of an inch square; it is then in a fit state to be mixed with

the bitumen or mineral or other pitch. The bitumen is freed from its extraneous matter in the ordinary way.

Take about ninety-three parts of asphalte reduced to powder, and passed through a sieve as directed, to about from seven to ten parts of bitumen or mineral pitch. The quantity of bitumen intended to be used is first placed in a melting cauldron or furnace, and when it is dissolved, the powdered asphalte is added gradually; the mixture is kept carefully stirred in order that it may not be burnt, and also that the asphalte and bitumen may be perfectly amalgamated. The mixture is kept over the fire, continually stirred, until the whole is thoroughly combined and is nearly fluid, and then kept over rather a slow fire until the whole is nearly in a state of ebullition: it then gives out a light white smoke in jets, and it is fit for use. When other asphalte is used, instead of the asphalte of Pyrimont, the quantity of bitumen to be added will vary according to the particular nature of the asphalte, and the proper quantity will easily be found by trial. When bitumen or mineral, or other pitch than that from the neighbourhood of Pyrimont is used, the precise proportion will also easily be determined by trial.

In applying the cement or composition to paving, add to about every 200 pounds weight of the nearly fluid mastic cement, about half a bucket full of very small, clean, and hot gravel or sand; this to be carefully stirred up with the mastic, and as soon as it is sufficiently fluid, that is, as soon as the mastic begins to give out the light white smoke previously described, it is fit for use. It may then be run into moulds, and remain until cold, when it will form blocks or slabs, which may be laid upon any proper foundation. These blocks or slabs are cemented together by pouring the fluid mastic cement between the interstices of the blocks or slabs. Sometimes, a thin coating of mastic cement is spread over the foundation, and the blocks or slabs are imbedded therein; in which case the cement is also poured in between the interstices. For the details of the application of this composition to the making of paths and roads, to the covering of buildings, and the linings of tanks and reservoirs—see *Mechanics' Magazine*, No. 863.

FLEXIBLE ASPHALTIC ROOFING.

THIS invention, patented by Mr. Pocock, is intended to supersede the use of slates, tiles, zinc, thatch, &c., in the covering and lining of farm buildings, sheds, cottages, and other erections. It is durable, light, and economical: its weight is only 60 pounds to a square of 100 feet, so that the walls and timbers to support it require to be but half the usual substance; it is also a non-conductor of heat, is impervious to damp, and will bear a heat of 220° without injury.

TO CRYSTALLISE TIN.

MIX one spoonful of muriatic acid, one of nitric acid, eight of water. Warm block tin over the fire, and rub it with a cloth dipped in the mixture. Ornament with coloured varnish.—*Mining Journal.*

IMPROVEMENTS IN PAPER-MAKING MACHINERY.

In making Paper by Fourdrinier's* machines, the pulp is spread over an endless wire cloth, under which a partial vacuum is produced; so that by the pressure of the atmosphere, the water or moisture is separated from the fibre. To produce this vacuum, or partial vacuum, expensive air-pumps have been used; and there is this disadvantage attending the use of the air-pump, that owing to the change of stroke of the pistons, a uniform degree of vacuum cannot be maintained; so that the pulp on the wire cloth passing over the vacuum chamber receives various degrees of pressure, and consequently, the paper is made of various thicknesses. Mr. Crompton, of Farnworth, Bolton, Lancashire, has patented an invention to maintain this partial vacuum at as uniform a degree as possible, in order that the atmosphere may uniformly press on all parts of the paper as it is progressively made by the endless web and pulp passing over the vacuum chamber.

Mr. C. proposes to accomplish this by the substitution of a revolving fan, for the air-pump, to withdraw the air from the vacuum box. To those acquainted with paper-making machinery, very little further description is necessary. The pipe or trunk, which in Fourdrinier's machines, as at present constructed, leads to the air-pump, should lead to a case containing the revolving fan, which may be placed in any convenient position with respect to the machine to which it is applied. It is desirable to avoid bends or projections in this pipe or trunk. The fan may have any number of vanes, and be of any shape; an odd number is, however, best. A water-syphon gauge is attached to the vacuum box to indicate the pressure, which may be regulated to a nicety by varying the speed of the fan employed. The speed which has been found best is about 1200 revolutions a minute.

Mr. John Evans, of Birmingham, has also patented an invention for the production and preservation of a uniform degree of vacuum beneath the endless wire web over which the pulp passes in making Paper with the Fourdrinier machine; and this by an apparatus cheaper than the common air-pump, easier worked, and less liable to derangement. Mr. Evans substitutes, for the common air-pumps, hydraulic air-pumps, working on the principle of gas-holders, thus:—Three cylindrical, or other shaped vessels, open at one side or end, and having valves in the top, opening outwards, are placed mouth downwards in three other vessels, or in one vessel divided into three compartments, open at top, and containing water. Three vertical tubes or pipes rise out of the horizontal tube or pipe leading from the vacuum box, through the bottoms of these last-named vessels, or one through each division, if one vessel with partitions be used. The tops or mouths of these pipes are on a level with the top of the vessel, and each mouth is covered with a valve opening outwards. The first-mentioned cylindrical vessels are placed mouths downwards in the water and over these tubes, and are connected to a three-throw crank by connecting rods, so that the three vessels worked thereby shall

* During the Session of Parliament, 1840, the sum of £7,000 was voted to the Messrs. Fourdrinier, for their introduction of Paper-making Machinery.

always be at different parts of a stroke at the same moment. The invention is, in fact, the application of an arrangement of three, or any other number, of the hydraulic blowing machines in common use at iron foundries and in smelting works, to the purpose of producing the vacuum in paper machines. Uniformity of pressure is maintained by the variation of the parts of the stroke of each vessel at the same moment; so that the greater the number of vessels, the more uniform will be the action, and the use of an odd number is also advisable.—*Mechanics' Magazine*, No. 863.

MANUFACTURE OF SUGAR.

On January 27, an important paper was read to the Academy of Sciences, at Paris, and communicated, by M. Peligot, "On Improved Methods of Extracting the Saccharine Matter from the Sugar-cane." From a long series of experiments, this young but able chemist has ascertained that the Martinique cane contains not less than ninety per cent. of the saccharine juice termed *vesou* by the French planters; and that this juice, when manipulated on an improved principle, will yield eighteen per cent. on the total weight of the cane in pure crystallised sugar. Hitherto, by the rude methods used in the West Indies for a long series of years, no more than from six to eight per cent. of pure sugar could be extracted from the *vesou* juice; and the best beet-root sugar-growers in France have succeeded, by most laborious and expensive processes, in obtaining the same result from the juices of that root. M. Peligot, however, has been enabled to make his experiments on the West India sugar-cane, by having considerable quantities of it brought over to Europe in a dried state, as well as large quantities of the *vesou* juice,—all prepared according to a new and admirable method invented by M. Appert. The dried canes and juice, which were carefully weighed and examined previous to exportation, have lost only an almost imperceptible portion of their properties by the voyage; and the result of the experiment has been as above stated. The importance of this discovery in a commercial view will be immense. In the first place, from the advanced state of chemical knowledge in Europe, and the means of applying chemical processes at a cheap rate, the extraction of the crystallised sugar will be always effected much cheaper and better, according to this new plan, in Europe than in the West Indies. Hence, it is intended to bring over great quantities of the dried cane and the *vesou* juice to France, in order that M. Peligot's method may be applied on the largest possible scale. This, if it come into general application, will entirely take the preparing of sugar out of the planters' hands, and will convert the islands into mere agricultural colonies; at the same time giving an immense development to the carrying trade from the ports corresponding with the West Indies. This discovery has produced an intense sensation at Paris, both with the Government and with the commercial and scientific classes of the community.

On Feb. 17, M. Biot read to the Academy of Sciences a paper "On the determination of the Saccharine Properties of the Juice

of the Sugar-cane by the Polarization of Light." He submitted to the test of circular polarization a portion of the *vesou* juice which had been employed by M. Peligot, in some recent valuable experiments; and then found that through a tube of 152 millimetres in length, this liquid gave to the plane of polarization of the red ray a deviation of 180 towards the right hand of the observer; which is exactly the deviation that would be caused by a liquid impregnated with an aqueous solution of crystallised sugar, in which the sugar entered in the proportion of 20 to 100. Saccharine juices, with less power of crystallization, cause a smaller deviation; and M. Biot suggests that this property may be employed by sugar-growers and refiners as a means of testing the relative productiveness of various juices.—*Literary Gazette*, No. 1206.

FRAUDS IN SOAP-MAKING.

ACCORDING to a recent Report of the Commissioners of Excise, silica and clay are employed to a considerable extent in the manufacture of Soap; and, as they do not contribute to its detergent qualities, but merely increase the weight of the soap, all such additions ought to be considered as adulterations, and to be prohibited by Government. Suppose a pound of good soap to cost 6d., and that another soap, containing 20 per cent. of silica or clay, is sold at 4¾d., the two will be exactly the same value, for four pounds of the good soap will go as far as five pounds of the adulterated soap. If the manufacturer charges 5d. for the pound of the adulterated article, he overreaches his customers to the extent of a farthing per pound. If this apparent cheapness have a tendency to increase the sale of soap, it operates as a premium to induce manufacturers in general to adulterate the article. The great extent to which the trade of Great Britain has reached was originally founded on the goodness of the articles manufactured; the present rage for cheapness has a universal tendency to adulterate every article exposed for sale; and, unless it is counteracted by a vigilant Government, it must terminate in the destruction of the foreign trade of the country. The soap made for exportation is always of inferior quality; hence the monopoly of the French soap-makers, who supply Italy, Spain, and South America, with all the soap required by those extensive countries. If silica soap be permitted to be made, it ought to be charged according to its specific gravity, allowing it to contain 20 per cent. of silica, as the maker supposes it to do. Hence, its specific gravity in the liquid state ought to be 1.3191. Thus, a pound of it will have the bulk of 21.016 cubic inches; or it ought to pay one-fourth more duty than common yellow soap. In what is called clay soap, the clay is not at all combined with the alkali; no soap is formed with it, and its action is merely mechanical; in fact, it diminishes the power of the soap with which it is mixed, in proportion to the quantity. The motives for mixing clay with soap are too obvious, and too well understood, to require any comment.

ALE AND PORTER PRESERVED.

In order to save Ale or Porter in good condition, for a considerable length of time, it is, for the most part, kept corked down in bottles. An apparatus has been invented, by which liquids may be kept constantly under pressure in casks as well as in corked bottles. The vessel is made in the form of a cask, of strong tin, strongly braced by iron hoops, and standing on its end. At the upper end is a cock, soldered to a tube, which is immersed to within an inch of the bottom of the cask. At the same end is a condensing syringe, by means of which the air can be forced into the cask; and whenever this is effected, it is obvious that the liquor will have a tendency to escape through the tube, and out at the cock, with a force proportionate to the degree the air is compressed by the action of the syringe. If the cock be turned, the liquor will rush out with violence, foaming with a fine head. Every time the air is drawn from the cask, the air it contains is not exposed to the atmosphere, whilst the liquor is kept under pressure, and no vent-peg is necessary. It is stated that all the advantages of bottling are obtained by the above process, without one-half of the waste and inconvenience attending the former system.—*Mechanics' Magazine*, No. 870.

SOCIETY OF ARTS.

The rewards adjudged by the Society during the Session were distributed on June, 1, at the Society's house, by his Royal Highness the Duke of Sussex, President. The interest of the proceedings was much enhanced by the presentation of a gold medal to Arthur Aikin, Esq., late Secretary to the Society, "for his long and eminent services, and for his valuable series of illustrations," during a term exceeding three-and-twenty years. Among the rewards presented were:—

In Mechanics and other Practical Arts.

To Mr. James Hopkins, Globe Brewery, King's Row, Horsleydown, for his setter for a carriage, five guineas.

To Mr. William Stidolph, 17, Lower Belgrave Street, Eaton Square, for his frame for teaching the blind to write, the silver Isis medal.

To Mr. James Reeves, 47, Upper Seymour Street, Somers Town, for his adjustable scaffold, the silver medal and £5.

To Mr. J. Hick, jun., Bolton, Lancashire, for his expanding mandrel, for turning lathes, the silver medal.

To Mr. Robert M'Ewen, for his double mercurial steam-gauge adapted to the purpose of a safety-valve for steam-engine boilers, the gold Isis medal.

To Lieut. Hills, R. N., Coast Guard Station, Lancing, for his machine for ascertaining the leeway of a ship, the silver medal.

To Mr. J. Sperring, Duke Street, Bloomsbury, for his chair for an observatory, the silver medal and £20.

To Mr. Lewis Thompson, 23, Paradise Street, Lambeth Walk, for his new and improved method of assaying gold, twenty guineas.

To Dr. O'Callaghan, 4th Dragoon Guards, for his apparatus for suspending injured limbs, the silver medal.

To Mr. Alfred Smee, Bank of England, for his chemico-mechanical galvanic battery, the gold Isis medal.

To Mr. C. A. Bruce, for discovering the indigenous tea-tracts, and successfully cultivating and preparing tea in the British possessions in India, the gold medal.—*Literary Gazette*, No. 1220; *abridged*.

Natural Philosophy.

TERRESTRIAL MAGNETISM.

THE following paper, referring to a matter which now occupies the attention of the whole civilised world, has been read to the British Association, by Major Sabine, and is entitled the "Report of the Committee, consisting of Sir John Herschel, Mr. Whewell, Mr. Peacock, Professor Lloyd, and Major Sabine, appointed to draw up Plans of Scientific Co-operation relating to the subject of Terrestrial Magnetism, and to report to the Association Grant of £400 at Birmingham," by which means a very extensive system of magnetical corresponding observations has been organised, embracing between thirty and forty stations in various and remote parts of the globe, provided with magnetometers and every requisite instrument, and with observers carefully selected, and competent to carry out at most, if not all, the stations, a complete series of two-hourly observations, day and night, during the whole period of their remaining in activity; together with monthly term observations, at intervals of two minutes and a half. Of these observatories, that at Dublin, placed under the immediate superintendence of Professor Lloyd, has been equipped and provided for by the praiseworthy liberality and public spirit of that metropolis. Those at Toronto, the Cape, St. Helena, and Van Dieman's Land, as also the two itinerant observatories of the Antarctic Expedition, by the British Government. Those of Madras, Simla, Sincapore, and Aden, by the East India Company. To which are to be added ten stations in European and Asiatic Russia; two by Austria, at Prague and Milan; two by the Universities of Philadelphia and Cambridge, in the United States; one by the French Government, at Algiers: one by the Prussian, at Breslau; one by the Bavarian, at Munich; one by the Spanish, at Cadiz; one by the Belgian, at Brussels; one by the Pacha of Egypt, at Cairo; and one by the Rajah of Travancore, at Trevandrum, in India. In addition to this list, it has recently also been determined, at the instance of the Royal Society, by the British Government, to provide for the performance of a series of corresponding observations, both magnetic and meteorological, in the Royal Observatory at Greenwich, under the able superintendence of the Astronomer Royal. At Hammerfest, in Norway, negotiations have been for some time carrying on for establishing an observatory of a similar description,

in which M. Hanstein has taken an especial interest. A great number of magnetic and other instruments, available for this service, it appears, have been left at Kaafiord, by M. Gaymard, acting for the "Commission Scientifique du Nord," under the direction of the French Ministry of the Marine—all which instruments, through the efficient intervention of M. Arago, it is understood, will be placed at the disposal of the observer or observers who may be appointed to conduct the observations. To complete the establishment, however, certain instruments, as well as registry-books, &c., are still requisite. The Council of the Royal Society have undertaken to supply these from the "Wollaston Donation Fund."

(The Report then details the appropriation of £185 from the funds of the British Association, for the instrumental equipment of the Breslau Observatory.)

By returns from several stations authorised by the British Government, so far as yet received, it appears that the observatories at the Cape and St. Helena may be expected to be complete and ready for the reception of the instruments in May. From Van Dieman's Land no accounts have yet been received. At Toronto, where the greatest delays and difficulties were to be expected, and have been experienced, the observatory was so far advanced, at the date of Mr. Riddell's last communication, as to leave no doubt of its completion in time for the regular observation of the August term. Meanwhile in this, as in all the other stations, all observations practicable under the actual circumstances of each are made and regularly forwarded; and here the Committee would especially call attention to the extremely remarkable phenomena exhibited at Toronto on the 29th and 30th of May, when, by great good fortune, a most superb aurora appeared at the very time of the term. During the whole time of the visible appearance of this aurora, as well as for some hours previous, when it might be presumed to be in progress, though effaced by daylight, all the three magnetical instruments were thrown into a state of continual and very extraordinary disturbance. In fact, at $6^h\ 25^m$ on the morning of the 29th, the disturbance in the magnetic declination during a single minute of time carried the needle over 10′ of arc; and during the most brilliant part of the evening's display (from $3^h\ 25^m$ Gött. M. T. ditto $4^h\ 35^m$), the disturbances were such as to throw the scales of both the vertical and horizontal force magnetometers out of the field of view, and to produce a total change of declination, amounting to 1° 59′. It should also be remarked, that the greatest and most sudden disturbances were coincident with great bursts of the auroral streamers. The correspondence, or want of correspondence, of these deviations with the perturbations of the magnetic elements observed in Europe and elsewhere on the same day, cannot fail to prove of great interest. Should it fortunately have happened that Captain Ross has been able to observe that term at Kerguelen's Land, which is not very far from the antipodes of Toronto, an indication will be afforded whether or not the electric streams producing the aurora are to be regarded as diverging from one mag-

netic pole or region, and converging to another.—*Literary Gazette*, No. 1237.

(The Report concludes by a reference to the vast range of observation embraced by this operation, and its promising results; and pays a just tribute to the personal exertions of Major Sabine, throughout the labour.)

To the proceedings of the British Association in this Inquiry, Dr. Lamont has contributed an account of the Magnetic Observatory of Munich, stating that the building had been undertaken in April, and that the regular series of observations, comprehending both the two-hourly daily observations and the term day observations, was commenced on the 1st of August. The magnetic observatory of Munich differs in two respects from other establishments of the same kind. In the first place, it is not a magnetical house, but a subterranean building, which is situated to the S.W. of the Royal Observatory, at a distance of about 130 feet, and connected with it by a subterranean passage. The depth of the magnetic observatory below the surface of the earth is 13 feet, thus affording the advantage of a temperature nearly equal at all times of the year, and rendering the corrections applied to magnetic observations in order to reduce them to a fixed temperature—corrections which are in general subject to considerable uncertainty — if not unnecessary, at least sufficiently small to be determined with the utmost degree of accuracy. In the second place, the instruments are of greater dimensions than those usually employed in magnetic observatories, and may be considered as sufficient in all respects for the most delicate investigations. The magnetic bars weigh 25lb. each; the theodolite has a circle of 2½ feet diameter, and an achromatic telescope of 3½ inches aperture. It may be remarked, that the horizontal-force instrument differs from the bifilar magnetometer, the power that holds the bar in a direction perpendicular to the magnetic meridian being that of a spiral spring. Besides the instruments fixed, there are portable instruments for making experiments with bars of ½lb., 1lb., 4lb., 10lb., and 25lb.

In the *Athenæum*, Nov. 28, it is stated that the American Academy of Arts and Sciences have resolved to co-operate in the great system of magnetical observations now going on in all parts of the globe, and have appropriated a sum of money for purchasing the necessary instruments.

In the *Quarterly Review*, No. 131, June 1840, has appeared an excellent paper upon the subject of Terrestrial Magnetism, whence the following is extracted:—

The success of these measures to secure an extensive co-operation may be collected from the following summary of stations, at which it is now certain that magnetic observations, co-operating for the most part to the full extent, but at all events so far as the *personnel* of the establishment will allow, in the proposed plan, and furnished with instruments identical with, or equivalent to, those supplied to the British observatories, are either already established, or in immediate

course of being so, the instruments being ordered, and the observers appointed.

British Stations.—1. Dublin, (Professor Lloyd;) 2. Toronto,* (Lieut. Riddell, R.A.;) 3. St. Helena,† (Lieut. Lefroy, R.A.;) 4. Cape of Good Hope, (Lieut. J. Eardley Wilmot, R.A.;) 5. Van Dieman's Land, (Lieut. J. H. Kay, R.N.;) 6. Madras,‡ (Lieut. Ludlow;) 7. Semla, (Capt. Boileau;) 8. Singapore,§ (Lieut. Elliot;) 9. Aden, (Lieut. Yule.) In addition to which, each ship of the naval expedition under the command of Capt. Ross, is provided with a corresponding set of apparatus, to be erected and used in concert, whenever opportunity may offer. (10, 11.)

Russian.—12. Boulowa; 13. Helsingfors, (M. Nervander;) 14. Petersburg, (M. Rupffer, General Superintendent;) 15. Silka; 16. Catherinenburg; 17. Kasan; 18. Barnaoul; 19. Nertschinsk; 20. Nicolajeff, (N. Knorre;) 21. Tiflis; 22. Pekin.‖

Austrian.—23. Prague, (M. Kriel;) 24. Milan, (Sig. Della Vedova?).

United States.—25. Philadelphia, (Professor Bache;) 26. Cambridge, (Professors Lovering and Bond).

French.—27. Algiers, (M. Aimé.)

Prussian.—28. Breslau,¶ (M. Boguslawski.)

Bavarian.—29. Munich, (M. Lamont, Director of the R. Observatory.)

Belgian.—30. Brussels, (M. Quetelet, Director of the R. Observatory.)

Egyptian.—31. Cairo, (M. Lambert.)

Hindoo.—32. Trevandrum, (Mr. Caldecott, Astronomer of the Rajah of Travancore.)

There is every reason to expect that this list will be largely increased within the present year. Indeed, six or seven more stations might already be inserted from our knowledge of communications in progress.

On the paramount importance of these investigations, the Reviewer observes:—

Regarded as a branch of that great assemblage of facts and theories which relate to the physical constitution of this our planet—the forces which bind together its mass, and animate it with activity—the structure of its service—its adaptation for life, and the history of its past changes—the nature, movements, and infinitely varied affections of the air and ocean, and all which our continental neighbours understand by their term *physique du globe*—(a phrase, of which our "terrestrial physics" is rather a faint and inexpressive reflection)—the science of terrestrial magnetism occupies a large and highly interesting place. Its relations lie among those mysterious powers which seem to constitute the chief arcana of inanimate nature and wondrous truths, from the configuration of our globe—the distribution of temperature in its interior—the tides and currents of the ocean—the general course of winds and the affections of climate—the different direction and intensity of the magnetic forces, and a thousand other

* Substituted for Montreal, originally proposed. This observatory is already in activity, and observations have been received from it.

† Already in activity.

‡ Substituted for Ceylon, originally proposed.

§ Substituted for Bombay, originally proposed.

‖ From Pekin a complete series cannot be expected; but, so far as practicable, the observatory there (already in activity,) will co-operate.

¶ This observatory is supplied with British instruments.

circumstances are now to be derived, sorted, and systematized, to give to science a prouder position, and confer on mankind, at large, inestimable benefits.

VIBRATION OF THE PENDULUM.

A MEMOIR from M. Petit, of Toulouse, has been read to the Academy of Sciences, at Paris, on the continuation of the experiments by M. Mathieu, at the Observatory at Paris, for determining the difference of the Vibration of the Pendulum, and, therefore, of the flattening of the earth, at Paris and Toulouse. After very careful ex-mentation, the results were found to be as follows :—

Depression of Earth.	Difference between Numbers of Oscillations at Paris and Toulouse.		Excess of Observations over Theo ry.
	Calculated.	Observed.	Oscillations.
$\frac{1}{252{\cdot}14}$	18·7526	18·7700	+ 0·0174
$\frac{1}{249{\cdot}88}$	18·6090	81·7700	+0·1610
$\frac{1}{306{\cdot}75}$	21·5695	18·7700	—2·7995

M. Petit thought that the difference of 2.7995 oscillations more than what the theory indicated, arose in great part from local influences, and that in part it was owing to errors of observation.

NEW PENDULUM.

THE Admiralty having left to Mr. F. Bailey's decision the form and construction of a New Pendulum, which they had resolved on sending out to the Cape of Good Hope, for the purpose of being swung by Mr. Maclear, at the several stations of the trigonometrical survey now in progress in that colony, he has not hesitated in recommending the *bar*-pendulum, as by far the best and most convenient for a travelling instrument. The pendulum which has been accordingly constructed is a brass bar, 60 inches long, 2 inches wide, and about half an inch thick. It was formed of several thin plates, which were pressed together by a rolling machine, and is, consequently, very compact and hard. Its specific gravity was 8·60, and its rate of expansion for one degree of Fahrenheit's thermometer, ·0001034. It is furnished with four knife-edges, thereby affording the advantages of four distinct pendulums on one and the same bar, and which thus serve as a check on each other. After every thing was finished, seven sets of experiments were made on each knife-edge, the mean results of which were respectively as follows :—Knife-edge A, 85906.322 vibrations ; B, 85905·725 ; C, 85904·107 ; D, 85903·427 ; in a mean solar day. The computations and corrections were made in the usual manner, with the exception of the correction for the height of the barometer, which can only be determined accurately by swinging the pendulum *in vacuo*. For this there was not time before the pen-

dulum was sent off, and the correction was assumed to be the *double* of that which is given by the formula which was usually employed, prior to the experiments of M. Bessel. The agate planes, which were made expressly for this pendulum, are attached to a solid frame of brass, three quarters of an inch thick, and having three foot-screws for the purpose of levelling the planes.—*Proceedings of the Astronomical Society*, Nov. 13.

MAXIMUM DENSITY OF WATER.

THE temperature at which water assumes its greatest density has been fixed by Muncke at 39°·05, by Stampfer at 38°·82, by Hällstroem at 39°·25; more lately Despretz has fixed this point at 39°·20: the mean of all these numbers is 39°·08, so that perhaps 39°, the number obtained by Crichton, may be taken as the true temperature, without any sensible error.—*Athenæum.*

ON WAVES.

MR. SCOTT RUSSELL has read to the British Association "the Report of the Committee on Waves," which must be considered as final, all the objects proposed having been fully accomplished*. The chief business of the Committee, during the past year, has been to carry the level line from Stirling to Leith, compare observations, and reduce the results. Mr. Russell described and illustrated the peculiarities of the tidal waves in the Frith of Forth, the extraordinary form they assume, and the phenomenon of two high waters of one tide; and attributed them to the slope of the bed, the level line, and to two tidal waves. This latter circumstance was in relation to the tidal discussions of Whewell and Lubbock. From their chart of cotidal lines it appeared that there were two great tidal waves in the Forth; the one passing through the British Channel to the east coast and German Ocean, and the other round the Orkneys. The two meet in the Thames, coincide, go up together, and cause one high water; the channel tide-wave arrives at the Forth about three hours before the northern one, but is overtaken by the latter at Stirling, where the two coincide, and a single high water results; although all up the Forth two high waters occur, and sometimes three, which, however, has not been accounted for. The first arrives to a shallow channel, and is therefore greatly retarded, and the lump on the crest is observed; whereas, the northern one comes to deeper channel, and, its velocity increased, moves much more rapidly than the former, overtakes, and becomes incorporated with it. It has been proved beyond doubt that a large wave can overtake a small one, pass through it, and leave it behind; that is, that first one wave shall be seen, then two, then one again. In conclusion, the Report briefly alluded to the mechanism of the wave, of translation, and the mathematical results worked out by Professor Kelland; also to the beneficial results arrived at with regard to the forms of vessels†.

* For previous Reports, see Year-Book of Facts, 1839, p. 85; and 1840, p. 98.
† Reported at page 71 of the present volume.

Professor Whewell acknowledged the high interest of these curious facts, and the great probability of their close relation to two tidal waves; but also, he observed, it is probable that other circumstances coincide and give depth to the water, &c. &c. It was difficult to improvise a discussion on such a subject, although tempting. The first thing that presented itself, as possibly an influence, was the age of the moon. Looking at each projected curve in the diagrams before him, certain waves always preserve the same forms; and, probably, throughout the whole lunation, others change their character. For instance, in April, from the 5th to the 8th, the wave previously double was single; on the 10th, apparently, and on the 11th, clearly and decidedly double again. He then suggested a comparison to be instituted for every day of the semi-lunation, to shew what relation each day of the moon had to the facts; and for this further tidal observations would be required.

Mr. Russell, in explanation of one or two points, referred to Whewell's map of cotidal lines; and observed that the tides in the German Ocean appear capricious, running in various directions. In one place they are marked as travelling in a circle, making for the coast of Norfolk and Suffolk, and thence sweeping round to the coast of Holland. As Mr. Whewell observed, great proof of the correctness of these tidal lines has lately been afforded; it was conceived that if the tides made as projected, in the central point of this sweep there would be no tide, as in the centre of a wheel there is no motion. A letter from the Admiralty has announced the discovery of this point where there is no rise*. This is, indeed, a striking proof of the truth of the theoretical views on waves.—*Literary Gazette*, No. 1237.

RESEARCHES ON THE TIDES.

PROFESSOR the Rev. W. Whewell has communicated to the Royal Society his *Twelfth Series*† of Researches—"On the Laws of the Rise and Fall of the Sea's Surface during each tide." The materials of the present investigation are the five months' Tide observations made at Plymouth; three months' observations made at Liverpool, under the direction of Capt. Denham, R. N.; and twelve months' observations made at Bristol, by Mr. Bunt, by means of his tide-gauge. According to the theory of the tides, the height of the surface of the water at a given place will increase as the sine, while the time increases as the arc. Hence, if the time be made the abscissa, and the height the ordinate, the curve representing one tide would be the *figure of sines*. The author, on making the comparison of the empirical curve of the rise and fall of the water, deduced from observation with this theoretical curve, finds a general agreement between them, subject to

* Captain Hewitt, in his survey of the German Ocean, has recently discovered a place where the rise and fall in the twenty-four hours is so small, that it may be considered as not existing.—*Athenæum*, No. 675.

† For the Ninth Series, see Year-Book of Facts, 1839, p. 85; and for the Tenth and Eleventh Series, Year-Book of Facts, 1840, p. 102.

certain deviations, consisting principally in the empirical curve indicating that both the rise and the fall are not symmetrical like the theoretical curve, in consequence of the fall being generally more rapid than the rise, and thus occasioning a displacement of the summit of the curve towards that branch of it which corresponds to the fall.

The Report "On the Application of a portion of the sum of £50, voted by the British Association for the Discussion of Two Observations," and placed at Prof. Whewell's disposal, will be found in the *Athenæum*, No. 674. A portion of the above sum has been expended upon calculations to determine the effect of the moon's declination upon the tides, which correction has been attended with peculiar difficulties. Another portion of the sum has been disbursed for calculations and operations performed by Mr. Bunt, and reported to the Royal Society in Prof. Whewell's *Twelfth Series*, as above.

Some supplementary operations of Mr. Bunt, at Axmouth, Devon, in connection with the recent Landslip there, are next recorded. These are a repetition of the levelling of a portion of the level line in the neighbourhood of the recent landslip in Devonshire. The southern extremity of the line levelled from the British Channel to the English Channel is at Axmouth. When the great landslip took place in that neighbourhood, it might naturally be suspected that a part of the level line would be disturbed. A moment's reflection made this appear improbable, since the movement seemed to be confined to the chalk and the clay below it; whereas the terminus of the level line was bedded in the red marl. Still, if the movement of the ground were the result of an earthquake, even the inferior strata might have been slightly stirred; and this appeared to be exactly one of the cases, the decision of which was contemplated in the project of the level line. In July, Mr. Bunt repeated the levelling of the line from the mark in the church tower, in the village of Axmouth, down to the shore, where is the granite block which forms the terminus of the line, a distance of $\frac{7}{8}$ths of a mile. It was performed (with the same instruments as before), when it appeared that the mark in the church tower was above the mark in the block .... 5·8836 feet, which in July 1838 had been found to be 5·8805 feet. The difference, $\frac{1}{27}$th of an inch, may be considered as a proof that there has been no sensible change. Mr. Bunt also levelled from the granite block, about 230 yards, to another bench mark eastwards, or towards the landslip, but found no difference of any importance.

In an "Additional note to the *Eleventh Series* of Researches on the Tides," by the Rev. William Whewell, the author gives the results of observations made at Petropaulofsk, in the bay of Avatcha, in Kamtchatka, lat. 53° 1′ N., long. 158° 44′ E., by the officers and men of the Seuivine, commanded by the present Russian Admiral Lütke; and which were conducted with great care and perseverance. The height of the surface was noted every ten minutes, both day and night, and when near its maximum every two minutes. It appears from these observations that the high water is affected in its time by

a very large diurnal inequality, reaching the enormous amount of above four hours, while its height is only slightly affected by an inequality of that kind; the greatest alternate inequalities of height were something more than a foot. In the low waters, there appears a much smaller inequality in the times, seldom amounting to more than one hour; but with regard to height, the diurnal inequality is much larger than that for high water, reaching to three, or even four feet; and this in a tide of which the whole rise, from the lowest to the highest, rarely exceeds five feet. The theory of these phenomena is then discussed. The results of another series of observations made in July 1827, at the port of Novo-Arkhangelsk, in the island of Sitkhæ, in Norfolk Sound (lat. 57° 2′ N., long. 135° 18′ W.) are also given, and their theory considered.—*Athenæum*, No. 654.

NEW CRYSTALLOGRAPHIC NOTATION.

Mr. J. J. Griffin has submitted to the British Association a new system of Notation of Crystals, which Professor Johnston recommends as no less useful to the private student than to the lecturer in the class room. The following is the *Athenæum* Report, No. 676:—

The author classes the planes of crystals into seven elementary sets, which he calls "Forms," or, the planes of crystallized minerals in various states of combination. Hence, a natural crystal, speaking crystallographically, is a combination. The seven fundamental forms are named P, M, T, MT, PM, PT, PMT. These symbols show the relation of the planes which constitute the forms to what are termed the axes of a crystal. These axes are three mathematical lines which cross one another in the centre of the crystal at an angle of 90°. The position of the first of these axes is perpendicular, whence it is called the principal or perpendicular axis, and is denoted by the sign p^a. The second axis is called the minor or middle axis, and is denoted by the sign m^a. It passes from the front to the back of the crystal. The third axis is the transverse axis. It passes from the left to the right side of the crystal, and is denoted by the sign t^a. All the planes of a crystal, when extended cut one or two or three of these axes, and they are denoted by letters referring to the axes which they cut. Thus P means two planes that cut p^a; M two planes that cut m^a; T, two planes that cut t^a; MT, four planes that cut m^a and t^a; PM, four planes that cut p^a and m^a; PT, four planes that cut p^a and t^a; PMT, eight planes that cut all the three axes. When the axes are cut at different distances from the centre of the crystal, the lengths of the respective axes are indicated by indices placed between the letters which constitute the symbol of the form. Thus $M\frac{1}{2}T$ denotes a vertical rhombic prism, the diagonals of whose cross section are as the numbers 1 and 2; and $P\frac{3}{2}M\frac{1}{2}T$ denotes a rhombic octahedron, whose three axes have the relation of $p^a_3\, m^a_1\, t^a_2$. Mr. Griffin entered into various details to prove that the occurrence of planes, not representable by one or other of these seven forms, was a mathematical impossibility, and that the proposed system of notation was amply sufficient for all the purposes of the chemist and mineralogist, while it had over other

systems of crystallography the advantage of requiring but a small amount of mathematical knowledge.

RED COLOUR OF ROCK SALT.

De Serres states that if a small portion of Red Rock Salt be placed with a little water on the object glass of a microscope, the salt dissolves and there remain infusoria *Monas Dunalii*. The same animals also exist in clear rock salt.—*Athenæum*, No. 662.

THEORY OF THE RIPENING OF FRUITS.

M. Fremy has treated of the modifications which pectine undergoes by the action of chemical and natural agents. Green fruits contain a substance which is insoluble in water, and which may be changed into pectine by the action of acids even when greatly diluted. When the pulp of green fruits is mixed with a large quantity of water, a mass of insoluble matter may be extracted, which, if placed for some minutes in a very dilute solution of malic, tartaric, or sulphuric acids, is converted into a mucilaginous substance, which is pure pectine. As green fruits contain very little pectine perfectly formed, Fremy attributes its formation in ripe fruits to the action of acid contained in the fruit. In fruits which are cooked, pectine is formed by the acid, whose action is accelerated by heat. Pectine may be considered as a true acid, which undergoes remarkable changes in its capacity of saturation. Pectine, by the influence of a base in excess, is converted into pectic acid. Both possess the same composition, but the latter requires two atoms of base to form a neutral salt. The change may also be produced by a vegetable albumen, existing in some fruits and roots, which appears to act as a fermenting principle.—*Athenæum*, No. 666.

SHOWER OF GRAIN.

Col. Sykes has communicated to the British Association the contents of a letter from India, from Capt. Aston, one of the diplomatic agents of the government of Bombay, in Kattywar, on the subject of a recent singular Shower of Grain. He stated that full sixty or seventy years ago, a fall of fish, during a storm in the Madras Presidency, had occurred. The fact is recorded by Major Harriott, in his *Struggles through Life*, as having taken place while the troops were on the line of march, and some of the fish falling upon the hats of the European troops, they were collected and made into a curry for the general. This fact, for probably fifty years, was looked upon as a traveller's tale; but, within the last ten years, so many other instances have been witnessed and publicly attested, that the singular anomaly is no longer doubted. The matter to which Col. Sykes had to call attention was not to a fall of fish, but to an equally remarkable circumstance, a shower of grain. This took place on the 24th of March, 1840, at Rajket, in Kattywar, during one of those thunder-storms, to which that month is subject; and it was found that the grain had

not only fallen upon the town, but upon a considerable extent of country and round the town. Captain Aston collected a quantity of the seed and transmitted it to Colonel Sykes. The natives flocked to Capt. Aston, to ask for his opinion of this phenomenon: for not only did the heavens raining grain upon them excite terror, but the omen was aggravated by the fact that the seed was not one of the cultivated grains of the country, but was entirely unknown to them. The genus and species were not immediately recognizable by some botanists, to whom it was shown, but it was thought to be either a *spartium* or a *vicia*. A similar force to that which elevates fish into the air, no doubt operated on this occasion, and this new fact corroborates the phenomena, the effects of which had been previously witnessed.—*Athenæum*, No. 679.

ANIMALCULAR CONSTITUTION OF CHALK.

Prof. Ehrenberg, in 1836, announced, that in examining Chalk and other calcareous rocks, he had discovered the characteristic fact, that the smallest grains of chalk appeared to consist of regular elliptical particles, possessing a crystalline aspect. Since that period, he has ascertained that the chalk of Puskaresz, in the east of Prussia, and that of the island of Rugen, of Schonen, Denmark, Gravesend, Brighton, Ireland, Meudon near Paris, Girgenti in Sicily, present two different structures; the one inorganic, distinguished by its regular elliptical structure and granular slaty disposition, and the other organic, consisting of microscopical shells. By mixing Canada balsam, by the assistance of heat, with the dry chalk, in a fine state of division, Ehrenberg found that the chalk contained an immense number of microscopical animalculæ hitherto unknown, varying in size from $\frac{1}{24}$ to $\frac{1}{258}$ of a line. A cubic inch possessed upwards of a million of them; consequently, a pound weight of chalk contains above 10,000,000 of these animalculæ. In the white or yellow chalk of the north of Europe, the mineral particles equal or exceed in quantity the organic matter. But in that of the south of Europe, the nautilites greatly predominate, and the chalk appears to be almost exclusively composed of them. Besides the calcareous nautilites, siliceous infusoria have been found in the chalk of Gravesend.

The microscopical nautilites have also been observed by Ehrenberg in the polishing slate of Oran, (a tertiary marl formation according to M. Rozet,) and in the polishing slate of Zante. Siliceous infusoria, in a state of good preservation, have been found in the chalk marls of Sicily, mixed with the nautilites. These marls belong to the chalk formation, and form ranges of hills. Ehrenberg has recognized the same characteristic animalculæ of the chalk in the limestone containing nummulites of Cairo, and of the pyramids of Gizeh. He has observed, altogether, 71 species of microscopical animals supplied with calcareous or siliceous shells, in the chalk; and, independently of these, several larger shells ($\frac{1}{24}$ of a line,) and many confervæ, sponges, and fuci. The genera *Textularia* and *Rotalia* are most predominant. He has found 7 genera and 22 species of microscopical nautilites, nummulites, shells of the genus Cypris, &c. He has hitherto determined 40

species belonging to 14 genera of siliceous infusoria, including the 8 already described, which were contained in the flint. He has found 5 species of plants containing silica. He has also obtained peculiar nautilites from the flint of the Jura limestone of Cracow, with remains of sponges; and lastly, the shells of the chalk in the siliceous kidney-shaped masses, found in the strata under the chalk at Cambridge.

It results from these researches of Ehrenberg—1st. That in all probability all the strata of chalk in Europe are the product of microscopical animalcules, most of them invisible to the naked eye. 2nd. That the microscopical nautilites appear to be the characteristic constituents of the chalk formation, principally the *Textularia globulosa, asiculata, aspera, brevis*, and the *Rotalia globulosa*. 3rd. That the chalk districts on the shores of the Mediterranean, which are generally considered as belonging to the tertiary formations, as well as the nummulitic limestone of Egypt, belong, in reality, to the chalk, that is, to the secondary formation, as is pointed out by the fossils which they contain. 4th. That the chalk of the south of Europe is distinguished by a larger number of fossil animalcules, and by the superior preservation of the shells. 5th. That the chalky formations of the south of Europe contain few or no flints; those of the north of Europe possess, on the contrary, many horizontal regular beds, which are separated from each other from one to six feet. This is a well-known fact; but what is new and remarkable is, the complete absence in the northern chalk of siliceous infusoria, which are so abundant in the chalk of Sicily and Oran. The relation of the infusoria to the flints is immediately apparent. It is possible that the flints have been produced by the gradual conversion of the beds of siliceous infusoria. This change produced in the north, in connexion with the greater number of mineral particles, resulting from the decomposition of the nautilites, would appear to assign a more ancient epoch to the production of the northern chalk.—*Athenæum.*

MAGNETIZING POWER OF THE SOLAR RAYS.

Professor Morichini, of Rome, was the first to observe that steel, when exposed to the violet rays of the solar spectrum, becomes magnetic. Similar experiments were tried by Mr. Christie in 1824; but the most accurate experiments upon this subject were performed by Mrs. Somerville in 1825, who determined that not only violet but indigo, blue and green, develope magnetism in the end of a needle, while yellow, orange, and red, produce no sensible effect. As many philosophers have failed in repeating these experiments, Mr. G. J. Knox, and the Rev. T. Knox, were induced to undertake the investigation of a subject "which has so often disturbed science," and the following is the result of their labours as laid before the Royal Irish Academy on the 24th February last:—"Having procured several hundred needles, of different lengths and thicknesses, and having ascertained that they were perfectly free from magnetism, we enveloped them in white paper, leaving one of their extreme ends uncovered. Taking advantage of a favourable day for making experiments upon the che-

mical ray, (known by the few seconds required to blacken chloride of silver,) we placed the needles at right angles to the magnetic meridian, and exposed them for two hours, from eleven to one, to the differently refrangible rays of the sun, under coloured glasses. Those beneath the red, orange, and yellow, showed no trace of magnetism, while those beneath the blue, green, and violet, exhibited, the two first feeble, but the last strong traces of magnetism. To determine how far the oxidating power of the violet ray is concerned in the phenomena, we exposed to the different coloured lights needles whose extremities had been previously dipped in nitric acid, and found that they became magnetic (the exposed end having been made a north pole) in a much shorter time than the others, and that this effect was produced in a slight degree, under the red (when exposed a sufficient length of time), strongly under white glass, and so strong under violet glass, that the effect took place even when the needles were placed in such a position along the magnetic meridian, as would tend to produce, by the earth's influence, a south pole in the exposed extremity. Conceiving that the inactive state produced in iron, (as observed by Schœnbein) when plunged into nitric acid, *s. g.* 1·36, or by being made the positive pole of a battery, or by any other means, might throw some light upon the nature of the electrical change produced, Experiments were instituted to this effect, which showed that no trace of magnetism could be thereby produced."

PHENOMENA OF CALEFACTION.

M. Boutigny has read before the Academy of Sciences, at Paris, a paper "On Calefaction," by which term he designates the singular phenomenon presented by water, when drops of it are thrown upon a very hot metallic surface.

It has been generally supposed that this effect is produced only at a very high temperature; but M. Boutigny finds that it occurs in a lead crucible, and consequently, below 612° Fahrenheit.

The Commissioner to whom M. Boutigny's paper was addressed, made this interesting observation: having immersed a piece of litmus paper into the crucible, to try whether the vapour was acid, he observed the part immersed to retain its colour, whilst that which was even in the orifice of the crucible became entirely red. The temperature was, therefore, higher in this place; and it is to be presumed that slow combustion took place analogous to that which occurs in the interesting experiments of M. Dobereiner.

M. Boutigny is of opinion that the phenomena of Calefaction described, may be connected with the explosions in steam-boilers: he is still occupied with the subject, and has made a great number of experiments with different liquids, and particularly with alcohol of different degrees of strength, with ether, oil of turpentine and lemons, and with alkaline and acid solutions.—*Journ. de Pharm., Mai*, 1840; *Philosophical Magazine*, No. 109.

THE IRISCOPE.

DR. READE has exhibited to the British Association the following experiment, with an instrument which he called an Iriscope. A piece of black polished glass was rubbed over in part with a solution of Castile soap; as soon as it was dry, the soap was polished off with a glove, until, as far as appearances were concerned, the one part of the glass was as clean as the other. He then blew his breath on the plate through a tube about half an inch in bore, and instantly the most vivid rings of colours, (resembling Nobili's,) were exhibited where the breath condensed on the part of the glass which had been previously soaped; while, on the other part, the condensed breath exhibited simply the usual dead grey colour.—*Athenæum*, No. 677.

NOBILI'S PLATE OF COLOURS.

THE effect produced by the late Sig. Nobili, of inducing colours on a steel plate, has led M. Gassiot to the invention of the following method of producing similar effects. Two of Prof. Daniell's large constant cells were excited with the usual solutions of sulphate of copper and sulphuric acid. A highly polished steel plate was placed in a porcelain plate, and a filtered solution of acetate of lead poured upon it. A piece of card-board, out of which the required figures had been previously cut with a sharp knife, was then placed upon the steel plate. Over the card, and resting upon it, was fixed a ring of wood, a quarter of an inch thick, and the inner circumference of which was of the same size as the figure. A convex copper plate was made, so that its outer edge might rest on the inner part of the wooden ring; and its centre placed near, but not in actual contact with, the card-board. Connexion was then made by the positive electrode of the battery with the steel plate; the negative being placed in the centre of the copper convex plate. The figure was generally obtained in from 5 to 35 seconds. If a concave, instead of a convex plate be used, the same colours will be obtained as in the former experiment, but in an inverse order.—*Proceed. Royal Society*, Jan. 16.

INCREASE OF COLOUR BY INVERSION OF THE HEAD.

SIR D. BREWSTER has read to the British Association the following new explanation of this phenomenon. The increase of colour caused by looking at a landscape, when the head is inverted, has been hitherto attributed, (and has been so explained by Sir J. Herschel,) to the rays of light falling on a part of the retina not accustomed to the excitement of direct vision. This view was entertained by Sir David Brewster, until experiment, protecting the eye from the lateral ray, &c. proved that it could not be the cause. In the perplexity of this proof, the exaggerated vision and the increase of colour, even to a painful degree, occurring to the eye in a state of inflammation, presented themselves to Sir David Brewster's thoughts, and reflection induced the belief that the phenomenon is the effect of a physiological and not of an optical cause. The increase of colour and the heightened tints ob-

served are the consequence of the additional blood pressed into the vessels of the eye by the inversion of the head.—*Literary Gazette*, No. 1240.

If this is the case, we are furnished with a principle which may enable us not only to appreciate faint tints, which cannot otherwise be recognised, but to perceive small objects which, with our best telescopes, might be otherwise invisible.

MUSCÆ VOLITANTES.

Sir D. Brewster has read to the British Association a paper "On the Phenomena and Cause of *Muscæ Volitantes*;" of which the following are the principal results:—1. That in persons of all ages, and with the most perfect eyes, transparent filaments or tubes exist in the vitreous humour, and at different distances from the retina. 2. That these filaments float in the vitreous humour, moving about with the motion of the head. 3. That these filaments are seen by means of their shadows on the retina, and are most distinctly visible in divergent light, their shadows being bounded by fringes produced by diffraction or inflexion. 4. That the real *muscæ*, resembling flies, are knots tied, as it were, on those filaments, and arising from sudden jerks or motions of the head, which cause the long floating filaments to overlap and run into knots. 5. By making experiments with the head in all positions, and determining the limits of the motions of the *muscæ*; by measuring their apparent magnitude, and producing double images of them by means of two centres of divergent light, the author was able to determine their exact place in the vitreous humour; and to ascertain the important fact that the vitreous humour in the living human eye is contained in cells of limited magnitude which prevent any bodies which they contain from passing into any of the adjacent cells.

Sir David Brewster concluded with the following observations: "I have dwelt thus long on the subject of *Muscæ volitantes*, not only because it is an entirely new one, but also on account of its practical utility. Mr. Mackenzie informs us, 'that few symptoms prove so alarming to persons of a nervous habit or constitution as *Muscæ volitantes*, and that they immediately suppose that they are about to lose their sight by cataract or amaurosis. The details which I have submitted to you prove that the *Muscæ volitantes* have no connexion with either of those diseases, and are altogether harmless. This valuable result has been deduced from a recondite property of divergent light, which has only been developed in our own day, and which seems to have no bearing whatever of a utilitarian character; and this is but one of numerous proofs which the progress of knowledge is daily accumulating, that the most abstract and apparently transcendental truths in physical science will, sooner or later, add their tribute to supply human wants, and alleviate human sufferings. Nor has science performed one of the least important of her functions, when she enables us either in our own case or in that of others, to dispel those anxieties and fears which are the necessary offspring of ignorance and error.'"—*Athenæum*, No. 677.

CONTRAST OF COLOURS.

M. CHEVREUL has published a very important work on "The Law of the Simultaneous Contrast of Colours, and their applications;" which he sums up in this formula: — "In the case of the eye seeing at the same time two contiguous colours, they appear to it the most dissimilar possible, with regard to their optical composition and the intensity of their tone." This theory he bases on a great number of instances, and deduces from it many hints of great importance to artists. He infers, for example, that the dead effect often arrived at in pictures by good colourists, arises from their eye having got so much affected by the contemplation of contrasted colours in juxtaposition, either in their own picture, or in what they are copying, that, so to speak, they no longer see true.—*Literary Gazette*, No. 1202.

M. Chevreul has also read to the Academy of Sciences, at Paris, three memoirs on his "Theory of the Contrast and Mixture of Colours." With regard to the former part of his subject, some curious instances were adduced to the effect which colours placed in juxtaposition have on each other. One of the most interesting was that of the way to produce the effect of silver in a pattern with a green ground. If the object to be coloured as silver was left purely white and grey, the effect could not be produced, and it would look quite dead, and any thing but metallic; whereas, if a slight admixture of green were made with the white, the silvery effect would be at once attained. An instance of this was exhiblted to the Academy, where a green border with silver vases on it had all the appearance of a bright and silvery whiteness strongly contrasted by the dark green; but on a piece of white paper being applied to it, so cut as to hide all the green part, and to let only the vases be visible, these ornaments were immediately seen to be of a very decided green colour. This is accounted for on the well-known fact, that the mixture of the three primitive colours, red, blue, and yellow, will produce black or grey; and that part of the grounding colours in the border in question, which in reality appeared in the white of the vases, required to be *harmonized* or *compensated* by another portion of the green before the eye could accommodate itself to the whole. M. Chevreul explains, on similar principles, the effect of the blue used by laundresses in linen giving a white effect to the eye—on account of the linen, in reality, possessing some red and yellow rays in it, and requiring them to be neutralized or compensated by the third primitive colour.—*Literary Gazette*, No. 1203.

SINGLE VISION WITH TWO EYES.

ON Jan. 30, in a paper read to the Royal Society, Mr. T. Wharton Jones animadverted on the doctrine which Mr. Wheatstone, in his paper on the Physiology of Binocular Vision, in the *Philosophical Transactions* for 1838, p. 371, has advanced in opposition to the received theory of Single Vision being dependent on the images of objects falling on corresponding points of the two retinæ. He maintained that, under these circumstances, the two impressions are not

perceived by the mind at the same instant of time, but sometimes the one and sometimes the other. If one impression be much stronger than the other, the former predominates, or even excludes, the other; but still the appearance resulting from the predominating image is, in one manner, influenced by that which is not perceived. He supposes there to be compartments of the two retinæ, having certain limits, of which any one point or papilla of the one corresponds with any one point of the other, so that impressions on them are not received separately; and he considers this hypothesis, combined with the principle above stated, to be requisite to explain the phenomenon in question.

ACHROMATIC EYE-PIECES.

On Jan. 7, was read to the Royal Society, a paper by the Rev. J. B. Reade, "On the Construction and Use of Single Achromatic Eye-pieces, and their Superiority to the Double Eye-piece of Huyghens" Experience, (the author observes,) has shown it to be impracticable to make a telescope even approach achromatism by employing the same object-glass with an astronomical as with a terrestrial eye-piece; for, if the focus of the blue rays of the object-glass be thrown forward, as it must be, in order to make it impinge upon the focus of the blue rays upon the terrestrial eye-glass, then there will be produced a great *over-correction* for the astronomical eye-glass, and *vice-versâ*. Hence, it appears that the application of the Huyghenian eye-piece to refracting telescopes is incompatible with the conditions of achromatism throughout the entire range of magnifying power; and that in reflecting telescopes, these eye-pieces are incompetent to correct dispersion, because they are not in themselves achromatic.

These defects the author proposes wholly to obviate by substituting, for the Huyghenian eye-pieces, single achromatic lenses of corresponding magnifying power, consisting of the well-known combination of the crown and its correcting flint lens, having their adjacent surfaces cemented together; thus avoiding internal reflections, and enabling them to act as a single lens. The achromatic eye-pieces used by Mr. Reade were made by Messrs. Tully and Ross, and are of the description usually termed single cemented triples.

MICROSCOPIC MEASUREMENT.

On September 23, Mr. Jackson read to the Microscopical Society a paper "On Microscopic Measurement." After alluding to the difficulties experienced upon this point by those who are in possession of good instruments, but are not aware of the very simple means by which they can obtain accurate measurements, Mr. Jackson proceeded to describe the different forms of micrometers in use. When single microscopes were the only ones employed in scientific investigation, the micrometer consisted of a slip of glass, ruled with fine divisions, varying from $\frac{1}{100}$ to $\frac{1}{1000}$ of an inch, on which the object was laid. In practice, however, this proved a very imperfect instrument, which, with the improvement of compound microscopes, has given place to others of a different construction. The best of these is the wire micrometer.

It consists of two parallel cobwebs, stretched across the field in the focus of the eye-piece, which can be separated by a fine screw, the head of which is divided into 100 equal parts. The side of the field, which is a parallelogram, is also indented with notches made by the threads of the same screw, so that the number of turns can be read off in the field of the instrument, and the fraction of a turn on the divided head. This instrument is rather expensive, and requires some care in using. A more simple method of measuring minute objects is to substitute for the wires and screw a piece of glass, divided by lines, with every fifth cut either longer or deeper, so as to be readily counted. This may be set in a cell, or dropped in the stop in the ordinary negative eye-piece. A mode of applying the stage micrometer has been long used by Mr. Lister. The microscope is placed horizontally, having a camera lucida attached to the eye-piece, by means of which the outline of the body to be measured is sketched. The object is then removed from the stage, and a divided glass substituted, the image of which is thrown over the sketched outline. By this method, which admits of several modifications, very accurate measurements may be obtained.—*Athenæum*, No. 679.

VIBRATION OF THE MICROSCOPE.

On July 22, Mr. Andrew Ross read to the Microscopical Society a paper "On a new mode of preventing vibration of the Microscope," which desirable end is obtained by applying to the extremity of each of the three feet of the instrument, a small tripod stool, about an inch and a half in diameter, through the top of which passes a screw that works on a moveable plate beneath. On the under surface is fixed a short strong spiral spring, with a loop at its lower extremity, by which it can be attached to the instrument at pleasure, by means of a small hook at the upper surface of the extremity of each of the feet of the base. The microscope stands upon three small patches of felt, about three-quarters of an inch in diameter; and if the pressure be partially, but not entirely, removed from these, by a few turns of the screws on the tops of the tripod supporters, a degree of steadiness is produced which has never been equalled by any means hitherto applied for that purpose.—*Athenæum*, No. 666.

DECOMPOSITION OF GLASS.

On Nov. 30, Sir David Brewster exhibited to the Philosophical Society of St. Andrew's, a Bottle of Wine recovered from the *Royal George*, which had been exposed to the action of the sea-water, and the glass of which had become decomposed in a remarkable manner. The thin films which covered the bottle like a silvery incrustation had all the properties of the brilliant scales of decomposed glass found in Italy, and produced by nearly 2,000 years' exposure to the elements. Sir David found the scales upon the bottle to be filled throughout with veins like those of agate, coinciding with the lines in which the glass had been twisted in the mechanical operation of forming the bottle. The lines in which the cohesion of the particles of the glass

was least, had been soonest decomposed by the action of the sea-water. This curious fact explains the cause of the similarly waved appearance in the decomposed glasses of Greece and Rome.—*Scotsman.*

ROCK CRYSTAL SPUN.

M. GAUDIN* has sent to the Academy of Sciences, at Paris, specimens of Rock Crystal, which he has succeeded in drawing out into threads several feet in length, with the greatest ease. One of these can be wound into a skein, and the other wound round the finger. M. Gaudin has also found that melted rock crystal moulds easily by pressure, and that it is very volatile at a temperature little above its melting point. Alumina acts very differently from silica; is always perfectly fluid, or crystallized, and cannot be brought to a state of viscosity; while viscosity, separated from all tendency to crystallization, is the permanent condition of silica under the oxygen blowpipe. Alumina is much less volatile than silica; but it oftener undergoes ebullition.

M. Gaudin has since tried the temper and relations of the rock crystal, and has obtained unexpected results. If a drop of melted crystal fall into water, far from cracking and flying to pieces, it remains liquid, and furnishes good lenses for the microscope. When struck by a hammer, the instrument rebounds, and the lump will sink into a brick rather than break; its tenacity being such, that pieces can be detached only as splinters. It resembles steel in elasticity and tenacity. Siliceous compounds act nearly in the same way as rock crystal. The sandstone of pavement spins off like it, with this difference, that its threads, instead of being limpid, are a pure white, nacreous, silky, and chatoyant, in a singular degree, so that they might be mistaken for silk; and the globules, to a certain degree, have the aspect of fine pearls, since they will possess the hardness of annealed rock crystal, instead of that of a calcareous compound. The emerald threads well, and its threads, which scratch rock crystal, are more tenacious than crystal threads.—*Journal de Pharmacie.*

MUSICAL SOUND.

M. DUHAMEL has communicated to the Academy of Sciences, at Paris, an elaborate memoir on the exact determination of the vibration of strings, and Musical Sounds thereby produced. The result of his method, which was the carrying out of the principle of D. Bernouilli, may be stated thus:—When a body causes at the same time several sounds, each of which it can produce separately, they are not all the elements of the surface, which produce each of these sounds, but its surface may be considered as divided into a finite number of parts, in each of which a single sound reigns exclusively. These different sounds are no other than what are heard altogether, and present the same case as if they

* A notice of M. Gaudin's process for converting Rock Salt into ductile thread, to be substituted for metallic wire in the Torsion balance, will be found in the Year-book of Facts, 1840, p. 121.

were produced respectively by distinct sonorous effects. — *Literary Gazette*, No. 1200.

On Oct. 12, M. C. Latour explained to the Academy of Sciences, at Paris, a new machine for effecting the vibration of a cord, with a view to ascertain the number of its vibrations compared with the synchronal vibrations of a hammer, in the production of musical sounds. He employed a small nodule of glass, at the extremity of a cord vibrating between two upright pillars or supporters. He still found that the number of the vibrations so obtained was only one half of the synchronal ones.—*Literary Gazette*, No. 1240.

CONSTRUCTION OF ROOMS WITH REGARD TO SOUND.

M. SHAND, in a paper "On the Agency of Sound," read before the British Association, observes: That the vibrating and undulatory, or oscillatory motions, are not only prevalent in the musical string, but in all matter in a state of agitation, is indicated by the following facts:

1st. In a musical string of given diameter and tension, when set in motion, the extent of the undulations is in the ratio of the length of the string — each undulation gives out a distinct sound, conformable in deviation to the extent of the undulation.

2nd. In the walls and ceiling of an apartment, these principles of action are also equally apparent: wherever there is an extended surface in any one place, the undulations are also extended, and these produce distant sounds, in the ratio of their extent. If the reflexions of the human voice, by this means, be prolonged, the reflexion of one letter falls upon the original sound of another letter, and occasions as much derangement as if one syllable or word were intermixed with another syllable or word; as one letter differs in sound from another letter, as much as do syllables or words. This is one great and leading error in the construction of places for public speaking; and it is alone sufficient to show how fallacious the idea is, of relying on the mere form of an apartment, without attending to and regulating this action, in not only the walls and ceiling, but in every reflecting body in an apartment, especially in glass, which is the most sonorous material. — *From the Athenæum Report*, No. 679.

IMPROVED THERMOMETER.

MR. J. DUNN, optician, in a paper read before the Society of Arts for Scotland, on Jan. 15, observes: "the maximum and minimum registering thermometers of Rutherford are not only the simplest, but by far the best yet constructed; indeed, all that is required in their construction, beyond an ordinary mercurial thermometer for the maximum, and a spirit of wine one for the minimum, is, to place them horizontally, and introduce into each a small index, in the one to be pushed up by the mercury, and to be dragged down by the alcohol in the other. No difficulty has been felt in executing the minimum one so as to *act* with certainty; but, in the mercurial one, the glass enamel index used by Rutherford himself, is drawn back by the mercury, and the same happens with various substances. The material usually employed,

and which answers best, is steel; which, however, is often rendered useless by the mercury amalgamating with it. Various fluids have been introduced to counteract this, but all are liable to the objection of mixing with the mercury. Mr. Dunn has, at length, found that, although mercury attracts glass, and amalgamates with steel, there is, (for his purpose,) no attraction between glass and steel, and mercury does not amalgamate with glass; wherefore, it is only necessary to introduce or interpose between the mercury and steel a small piece of glass, or second index, as is done in the improved thermometer.—*Jameson's Journal*, No. 58.

HEAT AND LIGHT TRANSMITTED THROUGH GLASS.

Mr. C. T. Coathupe has made several interesting experiments upon the effects of *solar light* upon paper prepared with nitrate of silver, and which indicated that the maximum depth of tint ensued from its transmission through ordinary unstained crown window-glass; that the next tint in intensity was produced by the direct solar rays upon the uncovered and perfectly exposed surface of the paper. The third in intensity, and almost equal to the second, was produced by the transmission of the sun's rays through glass of a "Waterloo blue" colour.

The fourth, through dark violet-coloured glass.	
The fifth, through purple	ditto
The sixth, through amber	ditto
The seventh, through brown yellow	ditto
The eighth, through dark green	ditto
The ninth, through light olive green	ditto
The tenth, through blood red	ditto
The eleventh, through crimson	ditto
The twelfth, through bright red	ditto.

From the ninth to the twelfth, there was no very remarkable effect produced by the solar rays after an hour and a half's exposure. The crown glass, the blue, the violet, and the purple glasses, produced deep tints, with which none produced from the other coloured glasses could be compared but as contrasts.

DEVELOPMENT OF ODOURS.

Every one is acquainted with the rotation which a piece of camphor undergoes in water, and the explanation of the fact which usually ascribes it to the disengagement of the ordorant vapours which exhale from it. It is known, also, that the leaves of the *Schinus molle* placed on water, forcibly retract when the surface of the water is covered by a layer of odoriferous oil. M. Morren has lately observed an analogous phenomenon produced by the volatile oil secreted by the down of the *Passiflora fœtida*. When some of the down or hair is placed under water, a small drop of green oil detaches from it, and swims on the water. This drop expands, contracts, expands, and then contracts again, and then seems to burst with force; but the fragments unite to expand again a moment after, and thus the action goes on for about ten minutes, after which the oil is by degrees concentrated, and becomes

motionless. These facts may serve, perhaps, to point out a physical theory of odours.—*Journal de Pharmacie.*

TEMPERATURE OF PLANTS.

M. Van Beck has constantly observed this phenomenon, in the course of his experiments—that in suddenly raising the bell-glass which cut off all communication between the air of the apartment and that of the plant, the heat of the latter always rose suddenly some tenths of a degree. This phenomenon, however, lasted only a few minutes: the magnetic needle soon retrograded, passing zero of the scale, and showing, by its opposite and permanent duration, that the living plant had a much lower temperature than the dead leaf, as is always the case in the atmosphere.

Is this phenomenon to be ascribed to the instantaneous access of free air to the plant, which, by stimulating its vital functions, that were depressed by its having been kept in a less pure air, augments at the same time its proper heat, *before the counteracting and frigorific influence of re-established evaporation has had time to make itself felt?*

M. Van Beck cannot venture to decide this: but he hopes that other philosophers and naturalists will engage in these researches, which, if he is not deceived, may yet throw some light upon many an interesting question in animal physiology.—*Compte-Rendu*, No. 1.

THE DRY FOUNTAIN.

An American Correspondent has contributed to the *Athenæum*, No. 659, an account of the drying up of the Silver Springs in Florida, which had never before failed. The Silver Springs became dry as the desert; and thickly strewn in the woods around were the bleaching skeletons and withering carcases of horses, deer, and wild cows, which had perished of thirst. The dry basin somewhat resembled the crater of a volcano, for though there was not a drop of moisture, the boiling motion was kept up in the sand, and on thrusting down a stick, the gas escaped in audible puffs.

NEW PLANETARIUM.

Mr. Bunt has received certificates from Sir John Herschel, Prof. Whewell, Capt. Smith, and Prof. Airy, of the excellent construction of his New Planetarium. Its principle is to lay down, in diagram, the elliptic orbits of the planets, with the values of axis major, and eccentricity corresponding to a certain time (perturbations omitted); and supposing the time of each revolution divided into 1000 equal parts, to represent upon the orbit the true arc described by the planet (perturbations omitted) in each one-thousandth part of the true revolution. This principle Prof. Airy considers far more accurate than that of the common orreries and planetariums, in which the eccentricity is entirely omitted. The combination with the Table will prevent errors from growing up in the course of years; and the latitude may be very well obtained from the Diagram.

Electrical Science.

NEW VIEW OF ELECTRICAL ACTION.

On Jan. 21, was read to the Electrical Society, "A New View of Electrical Action," by M. Laming. The author first assumes the fact that MM. Pouillet, Savary, and Becquerel, have been convinced that the natural tendency which bodies have to approach the earth is increased by electrifying them positively, and diminished by rendering them negatively electrical. Mr. Laming assumes also an attraction, operating among the atoms or particles of the electric fluid for one another, which he terms idio-attraction; and further, electricity to be attracted by the atoms of what is called ponderable matter, in such definite proportions as are represented by the several chemical equivalents or weights of these atoms. In the memoir, it should be added, the foregoing are established by a series of deductions based on data generally admitted by electricians of opposite opinions, and in strict conformity to the axioms of mechanical philosophy. M. Laming believes that his deductions afford not only a competent cause for gravitation, but also satisfactory causes for the disturbance of the electrical equilibrium; and the electrical conducting and insulating properties of bodies; and for many chemical phenomena, which may circumstantially be traced to result from electrical influence.

M. Laming's theory is based upon the following principles:—1. "All the atoms of electricity attract one another, in a sphere of action indefinitely extended, with a comparatively feeble absolute force, which varies as the square of the distance inversely.—2. Atoms of what is called ponderable matter attract atoms of electricity in large numbers, and in such definite proportions as are represented by their respective chemical equivalents, in a sphere of action indefinitely extended, and with a comparatively great, absolute force, which varies in some inverse ratio of the distance."

In brief, some notion of this theory of the idio-attraction of electricity may be derived from conceiving every atom of ponderable matter to be a central nucleus to an atmosphere of electrical atoms, and this electrical atmosphere to have a greater or less radius, as the weight of the atom is greater or less. These electrical atoms form around each central nucleus, concentric strata, or spherical shells; and all the central nuclei gravitate towards one another, because they are connected to their respective electrical atmospheres, which attract each other. To the perfection or imperfection of these spherical shells, and to the number of electrical atoms forming the definite equivalents of the several central nuclei, are attributed all phenomena known as chemical and electrical; and also, the cause of gravitation.

The first-mentioned fact of the gravitation of electrical atoms is most

important; and has been proved to the satisfaction of MM. Pouillet, Savary, and Becquerel.—*Literary Gazette*, No. 1202; *abridged.*

STATICAL ELECTRICITY.

Mr. G. J. Knox, M.A. & M.R.I.A., in a paper contributed to the *Transactions of the Royal Irish Academy*, vol. xix. proposes a theory which he has "deduced from the experiments of Sir H. Davy, given in his Bakerian Lectures;" and which in an extension of the views therein developed, reconciles the contact with the chemical theory, and reduces to the laws of *Statical* Electricity *all* the phenomena of electricity in motion. He then endeavours to show how the law of the definite nature of electro-chemical decomposition, so beautifully developed by Prof. Faraday, follows as a consequence from this theory. Were the particles of all bodies endued with the same quantity of electricity, and of the same density, it is evident from the laws of statical electricity, that no one body could have an attraction or repulsion for another: consequently, it is an evident fact, that the quantity and density of electric æther varies in different bodies: and as, from the theory above stated, electricity never leaves the particles, but merely (to use the words of statical electricity) accumulates upon the surface, and returns, it follows that the electrical states of the particles of bodies are constant and unalterable; and therefore, it is obvious, that the laws discovered by Dr. Faraday follow as a consequence from this hypothesis, which is at once clear and simple, includes all the phenomena, and is but a reference of the laws of *statical* electricity to the *particles* of bodies in place of their *masses.*

ELECTROLYSIS OF SECONDARY COMPOUNDS.

Prof. Daniell has addressed to Prof. Faraday a "Second Letter on the Electrolysis of Secondary Compounds," in which the author pursues his inquiry into the mode in which the chemical elements group themselves together to constitute *radicles*, or proximate principles. He considers his experiments to have established the principle that, considered as electrolytes, the inorganic oxy-acid salts must be regarded as compounds of metals, or of that extraordinary compound of nitrogen and four equivalents of hydrogen, to which Berzelius has given the name of *ammonium*, and compound anions, chlorine, iodine, &c. of the staloide salts; and this evidence goes far to establish experimentally the hypothesis originally brought forward by Davy, of the general analogy in the constitution of all salts, whether derived from oxy-acids or hydro-acids.—*Philosophical Magazine*, No. 110.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

On Feb. 6th and 13th, was read to the Royal Society the *Sixteenth Series* of Prof. Faraday's "Experimental Researches in Electricity;" and, on March 19th and 26th, was read the *Seventeenth Series* of the same elaborate investigations. The following summary of both Series has been abridged from the *Literary Gazette*, No. 1210.

These papers are devoted to a close experimental examination of the

two opposed theories of voltaic excitement; namely, those of contact and chemical action. When the author had discovered and established, in 1833, the definite chemical action of electricity, he applied that principle to the investigation of the disputed question; and then took part with those who held the theory of chemical action against that of contact. The contact theory of Volta as extended by others to the effects of bad conductors, and the chemical theory of De la Rive, are the two which he places in contrast and examines. In the theory of contact, it is said that when two conducting bodies are brought together, there is a force, at the points of contact, by which electricity leaves one of the bodies and goes to the other, without any change in the nature of the acting particles: that when a circuit or ring of metallic, or solid conducting bodies, is formed, the force at the different points of contact are exactly balanced, and so no current is produced; but, whenever a liquid or humid conductor forms part of the circuit, then this balance does not occur, and a current is the result. The author, therefore, sought for liquid or humid conductors which, in the first place, should be able to conduct very feeble electric currents, as those of a thermo-arrangement; and, in the next, should have no chemical action upon certain different metals plunged into them. Of these he found several, as solution of sulphuret of potassium, hydrated nitrous acid, solution of potash, &c., and he constructed currents of them and different metals. In this way, he obtained many arrangements with two metals, and a fluid conductor, which were perfectly well able to conduct a very weak thermo-current, and yet had no power, by themselves, of exciting any electric current; thus disproving that great distinction which the contact philosopher makes between good solid and imperfect fluid conductors in their theory, and which is essential to it in its application to the voltaic pile. As already stated, the sulphuret of potassium is one of the fluid electrolytes, which can thus form part of an inactive circle when arranged with metals, as iron and platina, on which it does not act chemically; but when associated with metals on which it *can* act, it then forms most efficient voltaic arrangements, thus proving the truth of the chemical theory. The author examines the results produced by it at such times. He shews that when, by the action of the soluble sulphuret on the metal, as with lead and bismuth, an insoluble investing film is formed, which prevents further chemical action, then the current stops as the action stops, notwithstanding that the whole circuit can still conduct a feeble thermo-current. He shews that when the investing coat is porous, and admits of the continued chemical action of the fluid, the current continues also. He shows the conditions and effects when conducting and non-conducting, or soluble and insoluble, bodies, are produced by the mutual action of the solution of sulphuret and metal: all the phenomena are reducible to these simple principles, that whilst the chemical action can go on, an electric current is produced, and when that action ceases, the current ceases also. These are the general contents of the *Sixteenth Series*.

In the *Seventeenth Series*, the author considers the influence of those

circumstances which, being known to affect the exertion of chemical affinity, are applicable in their nature to the voltaic pile. Two of these are *heat* and *dilution*. After searching for thermo effects and explaining all the precautions necessary, it is still found that heat, when applied to one of the contacts of a circuit containing only one metal and one fluid, can make it active in consequence of its influence over the chemical forces at the place of its application; and thus further evidence in favour of the chemical theory is obtained. Dilution produces still more striking results. If the two ends of a piece of metal be plunged into the same acid, either end can be made either positive or negative to the other, and a powerful current be produced merely by a difference of dilution at the two points of contact; *provided* the metal be one that can be acted on chemically by the acid, but not at all if it be a chemically inactive metal. Groups of four and five metals are given, in which any one metal can be made either positive or negative to any other in the same acid, solely by a difference of dilution. The contact philosopher says that metals have a certain order by virtue of their contact force; silver being negative to copper, copper to antimony, antimony to iron, iron to lead, lead to zinc, &c. In the paper, experiments are then described in which seven different solutions were taken and ten metals, and the order of the metals was found to be different for every solution, those which were first in one solution being almost last in another. Thus, the force of contact amongst the metals cannot be much, since it is here thoroughly overruled by chemical forces:—the author considers it as equal to nothing. A contrast is then drawn, by the comparison of numerous cases, between the sufficiency of chemical actions to produce voltaic currents without metallic contact, and the incapability of contact, either of metals or fluids, to produce any current without chemical action. Not a single case of the latter kind is known. That chemical action is quite sufficient to account for the origin of electricity in the voltaic pile, is then shewn by the close association and accompaniment of the latter upon the former, its occurrence and stoppage with it, and especially the dependence of its direction upon the place where the chemical action occurs; for as the latter can be changed about from side to side, the former is in such cases always found to change with it. The discovery, by Seebeck, of thermo-electricity, and the occurrence of its most powerful arrangements amongst the metals, is considered by many as shewing that metals have electro-motive forces at their points of contact. The author, therefore, examines these cases, and shews that they are quite unlike cases of voltaic excitement, presenting a different order of effects, having nothing in common with them as to the origin of the electricity, and being utterly inconsistent with them when viewed by the contact theory.

On April 2, was read to the Royal Society, the following "*Postscript*" to the *Seventeenth Series*: containing a reference to a passage in Dr. Roget's treatise on Galvanism, in the *Library of Useful Knowledge*, in which the same kind of argument taken by Prof. Faraday,

on the unphilosophical character of Volta's theory of contact, is strongly enforced*.

ELECTRIC TESTS.

M. Rousseau proposes to ascertain the purity of certain substances, and to detect any adulterations in them, by measuring their conducting power for Electricity. Some years ago, he described a simple apparatus by means of which the purity of olive oil might be tested on similar principles. He now states that by these means, any adulterations in chocolate or coffee may be readily detected: he finds that pure chocolate is a non-conductor or insulator of electricity, but that in proportion to the quantity of farina or fecular matter with which it is adulterated, the more easily does it conduct electricity; and in the same way, he states that coffee is an insulator, whilst chicory, with which it is often mixed, is an excellent conductor, and hence the presence of only a small quantity of that substance is easily detected in coffee by its increased conducting power. M. Rousseau also considers that this test may be applied with advantage to the examination of pharmaceutical extracts and preparations, because they very much differ in conducting power, and therefore any mixture or adulteration will be readily discovered.—*Athenæum*, No. 637.

ATMOSPHERIC ELECTRICITY.

Mr. E. M. Clarke has submitted to the Royal Irish Academy the results of his investigation of the origin of Atmospheric Electricity. He has shown the inapplicability of the electrometers hitherto employed for this purpose, and has devised an improved instrument, viz. an electrometer consisting of a bell of glass, seven inches in diameter, through the side of which passes a sliding graduated rod, furnished with a vernier, which indicates the distance, in hundredths of an inch, through which a single pendent slip of leaf-gold is attracted towards the rod which is in connexion with the earth. The slip of leaf-gold is attached to a vertical and well-insulated rod, which passes through a collar of leather, and can, therefore, be raised or depressed, as required by the varying intensity; so that the lower end of the leaf shall always, when electrified, be a tangent to the ball terminating the graduated rod.

By an extended series of experiments, Mr. Clarke has not only determined the mean monthly and annual force of electricity at the several hours of the day and night, but has also established its connexion with, and dependence upon, *temperature*, and the total quantity of moisture present in the air, as shown by the dew point.

The hour of the first electric minimum Mr. Clarke shows to be about 3 A. M., the electricity increasing with the temperature until 10 A. M., when a slight rising occurs: the electric tension again commences

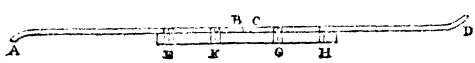
* Abstracts of the Sixteenth and Seventeenth Series will likewise be found in the Philosophical Magazine, Nos. 103 and 108. For the Fifteenth Series, see Year-book of Facts, 1840, p. 139; and for the Eleventh, Twelfth, Thirteenth, and Fourteenth Series, see Year-book of Facts, 1839, pp. 104—6.

rising about 11 A. M., and continues to increase until $2^h.\ 45^m.$, P. M.: all these movements being in exact proportion to the elevation of the dew-point and temperature. At 3 P. M., the dew-point and temperature begin gradually to lower, as does also the electricity, (though not so quickly); but from 5 to 7 P. M., the electric intensity rises, being acted upon and increased by the precipitation of the evening dew, which has now set free the latent electricity of the condensed vapour, in conformity with the experiment of Volta. Again, from 7 P. M., the electric intensity weakens rapidly, and descends in common with the dew-point and temperature, until they all reach their minimum about 3 A. M.

Thus is the varying diurnal intensity of the electric fluid shown to be the result of evaporation, which, besides its agency in carrying the electric fluid from our earth to the upper regions of the air, daily returns it to us by the conducting power of this vapour, in the direct proportion of its quantity.

TENSION SPARK FROM THE VOLTAIC BATTERY.

Mr. A. Crosse has addressed an interesting letter to Mr. J. P. Gassiot, F.R.S. of which the following is the substance:—"I once had a cork ball kept vibrating between the poles of four columns of De Luc's pile, without cessation, for upwards of twelve years! Now for the possibility of obtaining a spark between the poles of a voltaic battery before the circuit is completed. Were you to see the action of any unfinished battery of 1626 pairs of zinc and copper cylinders, you would allow the question to be set at rest. I take a small glass stick, and tie on it, with waxed silk thread, very securely, two wires of platina, with the two extreme ends ready to be plunged into two cups of mercury connected with the opposite poles of the battery: the two other ends of the wires are brought to the distance of about $\frac{1}{100}$th of an inch from each other, as below.



A B, C D, two platina wires secured on the glass stick E, F, G, H, at the parts E, F, G, H. The two nearest ends of the wires approach each other at B, C, to about the division of $\frac{1}{100}$th of an inch. The moment the connexion is made with the poles of the battery, a small stream of fire takes place at the interval between B and C, which I have kept up for many minutes, nor did it apear to cease. This experiment never fails; but with a much greater number of plates, each pair not being separately insulated, it would never succeed. To expect to produce a spark or visible current under similar circumstances with the above would be hopeless, except with a considerable number of pairs of plates, each pair being separately insulated. With 1200 pairs I have succeeded, and with 10,000 or 20,000 the distance

at which it would strike would be very great, comparatively speaking.

" I showed a friend, the other day, about 12 inches of iron chain illuminated pretty strongly by the passage of repeated shocks of my large electrical battery through it, charged by the water battery above. The intensity was so great as to keep up a constant dance of pieces of silver leaf between the two plates connected with the opposite poles.

" When I procured the stream of electricity in the interval between the platina wires, I used the water battery alone, without other apparatus, and not connected with the electrical or any other battery.

" Broomfield, near Taunton, July 17, 1840."—*Philosophical Magazine*, No. 109.

ECONOMIC VOLTAIC BATTERY.

On Jan. 7, was exhibited to the Electrical Society, an economical Voltaic Battery, from Mr. G. Mankrell. The advantages of its arrangement on the principle of the Constant Battery, are extreme portability, simplicity, and cheapness. The total cost of construction was seven shillings. It consists of a wooden trough, 22½ inches long, divided by partitions of wood into twelve cells, each 4½ inches deep, 4 inches long, and 1½ inch wide, coated with pitch, covered with shellac varnish. The zinc plates are placed in brown paper bags, and attached to the copper, which are arranged on the principle of Wollaston's battery. Mr. Mankrell's construction was exhibited in action. With the usual solutions of sulphate of copper and common salt, it produced one cubic inch of the gases in 27 seconds from acidulated water of the strength generally used in voltameters; it also heated 7 inches of platina wire to redness, and evinced powerful electromagnetic effects.—*Literary Gazette*, No. 1199.

NEW CHEMICO-MECHANICAL GALVANIC BATTERY.

Mr. Alfred Smee has communicated to the *Philosophical Magazine*, No. 103, a paper " On the Galvanic Properties of the Principal Elementary Bodies," which is one of the most interesting and important contributions of the year to this department of science. In it the author describes a new Battery of his invention, which he terms " Chemico-Mechanical," its superior efficiency depending on these two properties of metallic bodies, first developed in Mr. Smee's experimental investigations, namely, 1. That the galvanic energy of metallic surfaces is in proportion to the number of points on such surfaces; and, 2. That platinum, which has long ranked at the head of the galvanic metals, may be precipitated in powder on the surfaces of other and cheaper metals, so as to make them equal for galvanic purposes to platinum itself in its most comminuted state, such as spongy platinum, which consists of almost an infinity of points.

The battery which Mr. Smee proposes, is to be made of either copper plated with silver, silver, palladium, or platinum. The silver can be rolled to any thinness, and therefore it is not expensive. Each piece of metal is to be placed in water, to which a little dilute sulphu-

ric acid and nitro-muriate of platinum is to be added. A simple current is then to be formed by zinc placed in a porous tube with dilute acid; when, after the lapse of a short time, the metal will be coated with a fine black powder of metallic platinum. The trouble of this operation is most trifling; only requiring a little time after the arrangement of the apparatus, which takes even less than the description. The cost is about 6d. a plate of 4 inches each way, or 32 square inches of surface. This finely-divided platinum does not adhere firmly to very smooth metals, but when they are rough is very lasting, and sticks so closely that it cannot be rubbed off. On this account, when either silver is employed, or copper coated with silver, the surface is to be made rough by brushing it over with a little strong nitric acid, which gives it instantly a frosted appearance; and this, after being washed, is ready for the platinizing process.

The metal thus prepared may be arranged in the same way as an ordinary Wollaston's battery with advantage; a battery thus constructed possessing greater power than Professor Daniell's battery: four cells, containing 48 square inches in each cell, decomposed 7 cubic inches of mixed gas per five minutes, whilst four cells of Professor Daniell's, in which 65 square inches of copper were exposed in each cell, gave off only five cubic inches in the same time. However, in Mr. Smee's battery thus arranged, the action dropped to five cubic inches in five minutes, but it resumed its power after the contact had been broken for a few seconds. This battery also possesses great heating powers, raising the temperature of a platinum or steel wire, one foot long and of a thickness similar to that used for ordinary bird-cages, to a heat that could not be borne by the finger.* Its magnetic power is not less astonishing; three cells supporting the keeper of a magnet through forty-five, two cells through thirty-two, and one cell through twenty thicknesses of paper. An electro-magnetic engine was made to rotate with great velocity, the combustion of the mercury at the breaking of contact being exceedingly brilliant.

A battery of this construction should be in every laboratory, to be used in most cases where a battery is wanted, and the slight labour attending its operation is scarcely worth mentioning. Mr. Smee has used one for 48 hours consecutively without the slightest alteration either of the fluid, or in the arrangement of the metals; and the diminution attending its operation appeared to arise from deficiency of acid, for it *was instantly restored* by a little strong sulphuric acid in each cell. Where the battery is required to possess the same power for a long period, it might be advisable to separate the metals by a porous earthenware vessel, or by a thick paper bag, the joinings of which must be effected by shell-lac dissolved in alcohol. By these

* A small pot battery of six cells fairly fused into globules two inches of iron wire, and the combustion of different metals was extremely brilliant, when the battery was in combination with a Bachoffner's apparatus. A small piece of silver platinized, (two inches each way,) with a fold of zinc, was connected with a large temporary horse-shoe magnet, when it supported upwards of three hundred weight.

means, the sulphate of zinc is retained on the zinc side of the battery. The use of porous tubes, however, appears in this battery *to be nearly superfluous;* but it may be as well in an extensive battery to use porous plates.

The battery may be arranged like the pot batteries, but the troughs, such as used for Wollaston's batteries, are preferable from the convenience of packing, and from a battery of the same surface requiring so small a space. A battery may be constructed to form a most powerful calorimoter. It may also be arranged as a circular disc battery. Or it may be made as a Cruickshank's, each cell being divided or not by a flat porous diaphragm. Whatever arrangement is adopted, the closer the zinc is brought to the platinized metal, the greater will be the power.

The generating fluid which is to be employed is water, with one-eighth of sulphuric acid by measure; and the zinc ought always to be amalgamated in the first instance, as that process will be found very economical from its stopping all local action; whilst the amalgamation will be found not to require repeating, because there is no fear of copper being thrown down on the zinc, which occasionally happens in the sulphate of copper batteries.

The battery thus constructed is the cheapest and least troublesome in action that has ever been proposed, and from the smallness of its bulk will be found very valuable to electro-magneticians.

This battery may remain in the acid for any length of time, when neither the amalgamated zinc nor platinized silver will undergo the slightest change, and the whole will be as silent as death. Let only communication be made, the liquid in each cell becomes troubled; it boils—it bubbles, and produces the effects which have been detailed.

CARBON IN VOLTAIC COMBINATIONS.

Mr. J. T. Cooper has substituted with success for expensive platinum, *charcoal*, and the other form of carbon, viz., plumbago, and a peculiar kind of carbon, which is frequently met with as an incrustation in the retorts in which coal is decomposed for the purpose of gas-lighting. In order to show the comparative value of each of the substances, Mr. Cooper has subjoined the results of some of the experiments made with acids of the same strength, and with amalgamated zinc cylinders, each presenting to the action of the dilute sulphuric acid as nearly an equal surface as it was possible to obtain. The results are,—

	Mean cubic inches.
Thick platinum foil soldered to the zinc.....	3·517
Well burned charcoal clamped to the zinc.....	3·17
Plumbago clamped to the zinc.....	3·4
Hard carbon from gas retorts clamped to the zinc...	3.27

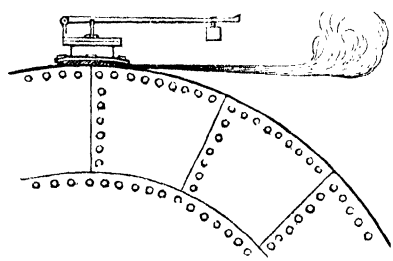
Thus, the platinum appears to possess a trifling advantage over the other substances; this, however, Mr. Cooper is inclined to ascribe to the more perfect contact of the platinum with the zinc by soldering them to its superior qualities as a conductor of electricity; and when the difference of expense is considered in the construction of large and

extensive combinations, the application of the above-mentioned substances must be regarded as of great importance to the chemist, and to those who may have occasion to employ such combinations as electro-motors; seeing that either with the charcoal, plumbago, or hard carbon, the purity of the nitric acid is a matter of indifference, strong commercial acid answering every purpose.

Mr. Cooper has subsequently found that some kinds of common coke, such as is very brilliant, close-grained, and has a columnar fracture, is equally good with the other varieties of carbon, and admits of being selected of almost any variety of form and size.—*Abridged from the Philosophical Magazine*, No. 100.

ELECTRICITY OF STEAM.

Mr. H. G. Armstrong, of Newcastle, has communicated to Professor Faraday the details of a very extraordinary electrical phenomenon, connected with the efflux of steam from the safety-valve of a steam-engine boiler, observed at Sedghill, about six miles from Newcastle. There is nothing remarkable in the construction of the boiler, which is supported by brick masonry in the usual way. The annexed sketch represents an end view of the boiler and safety-valve, by which



(Electricity of Steam.)

it will be seen that the valve is placed on the top of a small cylinder, having a flange round the lower end, which is fastened by bolts to the summit of the boiler, between which and the flange a cement, composed of chalk, oil, and tow, is interposed, for the purpose of making the joining steam-tight.

The steam began to escape at this joining, through a fissure in the cement, and continued to issue from the aperture in a copious horizontal jet. Soon after this took place, the engine-man, having one of his hands accidentally immersed in the issuing steam, presented the other to the lever of the valve, with the view of adjusting the weight, when he was greatly surprised by the appearance of a brilliant spark, which passed between the lever and his hand, and was accompanied by a violent wrench in his arm, wholly unlike what he had ever experienced before. The same effect was repeated when he attempted to touch any part of the boiler, or any iron-work connected with it, provided his other hand was exposed to the steam. He next found that

while he held one hand in the jet of steam, he communicated a shock to every person whom he touched with the other, whether such person were in contact with the boiler or merely standing on the brick-work supporting it; but that a person touching the boiler received a much stronger shock than one who stood on the bricks.

The boiler had been cleaned out the day before Mr. Armstrong saw it, when a thin incrustation of calcareous matter, reaching as high as the water-level, had been removed, and, consequently, the indications of electricity, though still existing, were very much diminished. Still, when Mr. Armstrong placed one hand in the jet of steam, and advanced the other within a small distance of the boiler, a distinct spark appeared, and was attended with a slight electrical shock. Thus, it appears pretty obvious that the phenomenon is, in a great measure, though not wholly, dependent upon the existence of an incrustation within; and the reason why such effects do not in any degree attend the effluxion of a jet of steam from a boiler in ordinary cases, must, Mr. Armstrong apprehends, be sought for in the fact, that in the present instance the steam escaped through an aperture in a non-conducting material, while, in a vast majority of cases, the escape must take place through a metallic orifice. Can the explosion of boilers, respecting the cause of which so much uncertainty at present exists, have any connexion with the rapid production of electricity which thus appears to accompany the generation of steam?

In a second communication Mr. Armstrong details some experiments made by him at the suggestion of Professor Faraday, when he found the results the same, and likewise with the second boiler of the engine. He ascertained that the water used in both boilers had been pumped out of a mine in a neighbouring colliery, where a small high-pressure engine filled with it gave like results. Upon repairing, however, to another high-pressure engine, which belonged to the same establishment, and the boiler of which was filled with *rain* water, instead of that drawn from the mine, Mr. Armstrong could not obtain any trace of electricity in the steam from the boiler, not even sufficient sensibly to affect the gold-leaf electrometer. The presumption is, then, exceedingly strong, that the phenomenon is, in some way, occasioned by the peculiar nature of the water from which the steam is produced.

To this letter Professor Faraday has appended two notes: one respecting his analysis of the incrustation deposited by the above water:—it is grey and hard; it contains traces of a soluble muriate and sulphate, but consists almost entirely of sulphate of lime, with a little oxide of iron and insoluble clayey matter, carried in, probably, by the water. In the second note Professor Faraday observes: "the evolution of electricity, described by Mr. Armstrong, is most likely the same as that already known to philosophers on a much smaller scale, and about which there are as yet doubts whether it is to be referred to mere evaporation, as Harris says, or to chemical action, according to others. This point it neither settles nor illustrates; but it gives us the evolution of electricity during the conversion of water

into vapour, upon an enormous scale, and, therefore, brings us much nearer to electric phenomena of volcanos, water-spouts, and thunder-storms, than before."

In the *Philosophical Magazine*, No. 111, wherein these communications appear, there follows an account of an analogous phenomenon, viz. the production of electricity by two steam-boilers, at Cromlington Colliery, near Newcastle, the communicant being Mr. H. L. Pattinson, F.G.S. In the succeeding No. (112 of the *Philosophical Magazine*), there appear further experiments by Mr. Armstrong and Mr. Pattinson. Mr. A. tried a number of boilers in Newcastle and neighbourhood, in which steam was propagated under different pressures, and from water of various descriptions: and by insulating himself, and holding a conducting-rod in the steam discharged from the safety-valve, succeeded, in every instance, in obtaining electrical sparks, varying from about one-fourth to about half an inch in length; and, in some instances, sparks of the measured length of four inches were drawn. Mr. Pattinson agrees with Prof. Faraday as to the nature of the electricity, which "appears to originate at the instant of vapourization, and the steam as it collects within the boiler is electrified with positive electricity, the water and the metallic boiler being at the same time negative. In this condition, the electricity of both is latent, like the electricity of the two plates of an excited electrophorus; but the instant steam is suffered to escape, its positive electricity, being carried off along with it, and out of the influence of the equivalent quantity of negative electricity in the boiler, becomes free, and hence the steam is electrical with positive electricity. The same thing takes place with the boiler, in which negative electricity is set at liberty as the steam escapes, and which becomes evident on insulating the boiler."

Dr. C. Schafhaeutl has communicated to the *Philosophical Magazine*, No. 112, some elucidatory Remarks upon this phenomenon; in which he questions whether the electricity of the steam was not in close connexion with the deposit, or the induration of the deposit upon the plates of the boiler; and he refers to his having already noticed the electricity of the escaping steam becoming distinct during the deposition of certain salts held in solution by boiling water, which fact he had already noticed in a paper on steam-boilers.

ELECTRICAL CLOCK.

A GERMAN artist has recently invented a Clock, of which the motive principle is electrical: the pendulum meeting at either side with a Voltaic pile, by which it is repelled alternately in contrary directions; so that when the pendulum is once set in motion, it is continually kept going.—*Times*, Nov. 11.

ON MAGNETISM.

ON June 5, the Rev. Dr. Scoresby detailed to the Royal Institution his recent attempts to produce in steel a higher degree of magnetic energy, and to give to such energy tenacity or permanency. The compound compass-needle, consisting of several steel bars tempered

throughout, was fully described and exhibited to the British Association at Bristol, in 1836; and in the spring of 1839, Dr. Scoresby published his subsequent researches and experience. The most efficient and highly susceptible compass-needle recent investigations have led him to adopt, is a combination of two bars only. The great superiority of this instrument, spaced, and tempered throughout, over the ordinary compass-needles, which he had obtained as the best from the naval stores, was clearly exhibited. Our naval readers will fully appreciate the advantage of a compass-needle with sufficient weight to ensure accuracy in the roughest weather, and with magnetic energy to render it highly susceptible to the slightest deviation. The dangers from the sluggish compass thus removed, will also be a boon to the underwriters. In the application of magnetism to civil engineering, Dr. Scoresby recommends the use of the magnet and needle in tunneling to ascertain the distance of the headways. The present method, by blast, is attended with considerable danger. Their efficiency depends upon the tendency, which Dr. Scoresby has proved, of all substances to magnetic agency. No body, not even iron, except inasmuch as its magnetic condition be increased or diminished, offers resistance to the magnetic energy. At the conclusion of the illustration, a powerful magnet was exhibited. It was constructed of 196 steel plates as hard as glass, such as are used for busks, arranged in two bundles. Its capability to induce magnetism was very great. A large key, held from four to five inches distant, supported more than its own weight. A novel effect shewn attracted great attention. From 6 to 7000 brads or nails, sometimes also called sprigs, were taken up and held by the magnet, and presented a metallic mass, but plastic like an amalgam, to be moulded into any form; spread out, or drawn rope-like, it yielded to the hand, and remained in the shape the moulder desired.—*Abridged from the Literary Gazette*, No. 1221.

ELECTRO-MAGNETIC NOMENCLATURE.

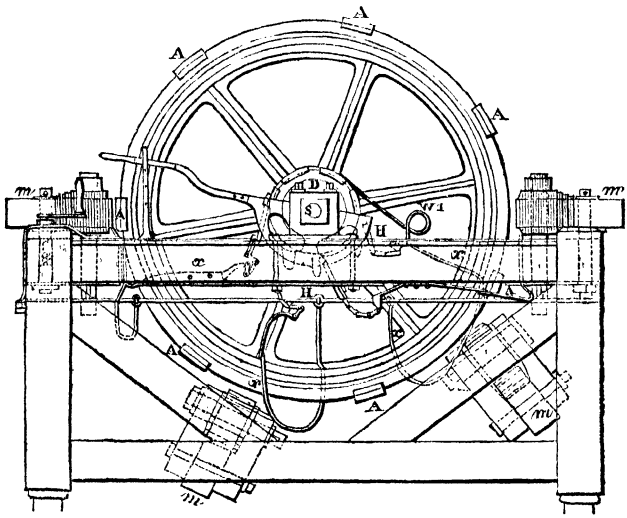
Much difficulty arises in naming the two poles of a Battery: they are called the positive and the negative end, the anode and the kathode, the platinode and zincode. Now, as each pole of a single battery becomes reversed, if the battery be doubled, Mr. Smee proposes to name the two ends from the oxygen and hydrogen, since it has been shown that the galvanic current owes its power of decomposing many substances entirely to these gases. The names proposed are the *oxode*, at which oxygen is evolved; and the *hydrogode*, where the hydrogen is given off.—See *Philosophical Magazine*, No. 104, p. 403.

TAYLOR'S ELECTRO-MAGNETIC ENGINE.

Mr. W. H. Taylor, late of New York, has patented two Electro-magnetic Engines, both of which are constructed on the same principle. That represented upon the next page has been exhibited at the Colosseum, in the Regent's Park, in active operation, turning articles of wood, metal, and ivory. The peculiar principle of action, which gives the present invention such a superiority over all previous

contrivances for obtaining a working power from electro-magnetism, (the best of them mere toys,) is thus explained by Mr. Taylor.

Most of the previous plans have depended on taking advantage of the *change of polarity*, of which masses of iron fitted as electro-magnets are susceptible, so as to cause them alternately to attract and repel certain other electro-magnets, brought successively within the sphere of their influence, and thus to produce a continuous rotatory movement; and the failure of these attempts Mr. Taylor assumes to be owing to the difficulty, if not the impossibility, of multiplying or accumulating power by such means. Instead of this, Mr. Taylor employs, as his prime movers, a series of electro-magnets, "which are alternately and (almost) instantaneously magnetised and demagnetised, *without any change of polarity whatever taking place*; and in bringing certain other masses of iron, or electro-magnets, successively under the influence of the said prime movers, when in a magnetised state, and in demagnetising the said prime movers as soon, (or nearly so), and as often, as their attractive power ceases to operate with advantage." Or, in other words, his invention consists "in letting on and cutting off a stream of the electric fluid, in such alternate quick and regular succession to form a series of electro-magnets, that they act always attractively or positively only, or with such a preponderance of positive attraction, as to exercise an uniform moving force upon any number of masses of iron or magnets, placed so as to be conveniently acted upon."



(Taylor's Electro-magnetic Engine.)

In this engine, the electro-magnets are stationary, and the masses of iron on which they act are fitted on the rim of the wheel, which is

made to revolve. M M M M are four electro-magnets of equal size, fixed in a frame-work. A A are the pieces of (soft wrought) iron called armatures, let into the periphery of the wheel W, at equal distances from one another. The wheel should be of metal, or wood; but if metal, the rim should be covered with wood, or some other non-conducting substance, so as to place the metal parts out of the magnetic influence. These armatures should have only half their depth let into the wheel; and they should be of the breadth and height of the two iron faces of one of the electro-magnets M M, (including the interval between these faces,) and in depth equal to half the height. The magnets are so fixed in the framework, that when the wheel revolves, the armatures just pass without touching them. The distance between the centre points of two adjoining armatures is equal to the height of the iron faces of all the magnets employed; so that, as the magnets pull in succession, the pull may commence when the edge of an armature is opposite the edge of a magnet, in which position the pull is strongest. The magnets are also so fixed in the framework, that when the centre of one of them is opposite the centre of an armature, another magnet shall have one of its edges just opposite the edge of an armature, and a third its contrary edge opposite a contrary edge of another armature, while a fourth magnet is directly in the centre between the two. D is a disk, divided into twice as many parts as there are armatures, each part being alternately copper and ivory. The size of the external rim of the copper parts bears the same proportion to that of the ivory, as the rim of the armatures is to the curved interval between them. The disk is keyed to the shaft S, and revolves with the wheel. H H H H are four bent copper bolts or hammers, each connected with the extremities of the wires on one pole of each of the electro-magnets; the extremities of the wires on the other pole of each magnet being joined by screws or soldering to a wire or wires $x\,x\,x\,x$; which go at once to one pole of the battery. The hammers H H H H, are moveable on pivots attached to a frame C, and are kept pressing against the external periphery of the disk by springs, as shewn in the figure. The hammers are placed at such distances from each other, that each of them respectively just begins to touch the copper portion of the disk, when the magnet, to which it is attached, is in the position with regard to the armatures before described; and it is found, that by the adoption of the proportions before laid down, when the centre of any armature is opposite the centre of any magnet, the hammer connected with it just rests on the ivory portion of the periphery of the wheel, whereby the magnetism is suspended, so as to allow the armature to pass freely while another copper portion of the disk is advancing under another hammer, whereby the succeeding magnet becomes charged in its turn: and so on, successively. To produce a reverse action of the wheel, the semi-circular frame C, which supports the hammers, is made to slide by the action of the handle as shown in the figure. If moved, so that the hammers shall be shifted a space equal to half the external rim of any of the copper parts of the disk, the magnets are charged after the armatures are opposite the magnets,

and a back action is engendered, by which the wheel is soon stopped. And if the frame be moved, so that the hammers are shifted a space equal to the *whole* rim of one of the copper points of the disk, then the magnets are charged and suspended at their proper intervals as before, and a reverse action of the wheel is produced. W W is a copper wire which proceeds from one of the holes of the battery, and is made to press by a spring against the inner copper part R of the disk, which projects a little in that part for the wire to rest upon.

When the machine is in operation, the electric current proceeds from the battery along the copper wire W through the copper of the disk, along the copper hammer, which is in contact with any copper segment of the disk, and through the copper wire proceeding from the said hammer round the magnet, along the wires *x x x* to the opposite pole of the battery.

The general result of the very ingenious arrangements we have thus described, is exceedingly striking. Nothing can be more continuously regular or beautiful than the motion imparted to the wheel—the agent, (unlike fire, water, or steam,) invisible, yet its effects palpable to the senses—capable of being called instantaneously into action (no time lost in getting up the steam,) and of being as instantaneously brought to a dead stop. We can see nothing in the principle of the invention which should prevent this power being multiplied to any desired extent. A battery of adequate sustaining power, neither too costly nor too bulky, is all that is wanted; and, in obtaining this, there can be no difficulty, in the present advancing state of electro-magnetic science. The engine is distinct from the battery which furnishes the electric fluid, in the same way that a steam-engine is technically considered distinct from the boiler, whence it draws its supplies of steam.—*Abridged from the Mechanics' Magazine*, No. 814.

ELECTRO-MAGNETISM AS A MOTIVE POWER.

Professor Jacobi, in presenting to the British Association, as he termed it, an historical sketch of the law regulating Electro-magnetic Machines, which he conceived would lead to the general use of this force as a Moving Power, entered into an elaborate detail of numerous experiments made by him to determine the laws which regulate electro-magnetic phenomena, and illustrated these laws by the several formulæ derived from the results. Any brief notice would fail to convey a satisfactory knowledge of the laws established by these experiments. The papers, however, containing the data, &c. have been read to the Academy of Science at St. Petersburgh, and already published. In the conclusion of his paper, Professor Jacobi stated, that by means of machinery, which he was ready to explain privately, he had succeeded in propelling a boat twenty-five feet long, seven feet broad, drawing 2½ feet water, and containing fourteen persons, at the rate of three miles an hour, by means of electro-magnetism, the force produced being equal to five-sixths of one horse power. This was accomplished by a battery of sixty-four plates, of the area of thirty-six square inches each.—*Literary Gazette*, No. 1240.

ELECTRO-MOTIVE POWER OF HEAT.

DR. DRAPER, Professor of Chemistry in the University of New York, has communicated to the *Philosophical Magazine*, No. 105, a memoir, in which he shows: 1st. That equal increments of heat do not set in motion equal quantities of electricity.

2dly. That tension undergoes a slight increase with increase of temperature; a phenomenon due to the increased resistance to conduction of metals, when their temperature rises.

3dly. That the quantity of electricity evolved at any given temperature, is independent of the amount of heated surface; a mere point being just as efficacious as an indefinitely extended surface.

4thly. That the quantities of electricity evolved in a file of pairs, are directly proportional to the number of the elements.

Dr. Draper has effected this task, from thermo-electric currents being now employed in a variety of delicate physical investigations, and there appearing to be much misconception as to their character.

ELETRO-MAGNETIC APPARATUS IN MINING.

MR. R. W. FOX suggests that more extended researches than have hitherto been made, should be pursued in mining districts, to determine whether the Electro-magnetic Apparatus can or cannot be rendered useful in practical Mining. Experiments for this purpose may easily be made by miners themselves, after an hour's instruction in the use of the apparatus. Thus, a metallic conduction having been established between a mass of conducting ore in a vein, and the galvanometer, by means of a copper plate and wire, the plate attached to the second wire may be carried through a level or gallery, and pressed for an instant against the locks on each side, at intervals of a few yards, the other end of the wire having been first connected with the galvanometer. If, when contact is made with the rock at any point of the level, the galvanometer should be particularly affected, the experiment should be repeated till the part of the rock is discovered at which the maximum effect is produced. A zinc plate may then be substituted for the copper plate, or pressed between the latter and the rock; next, if convenient, platina or palladium may also be used for making the contact; and the modifications of the currents produced by the different metals should be noted. With one of the two last named metals, they are most likely to be exhibited as they exist in the vein, unaffected by the apparatus. The same tests may be applied to any water flowing into the level, in order to ascertain whether or not it is connected with ore in the neighbourhood.—*Selected* from a paper in *Jameson's Journal*, No. 56.

IMPROVED GALVANIC TELEGRAPH.

MR. PONTIN has exhibited to the British Association an improved Galvanic Telegraph, of his construction. Its peculiarity consists in its requiring only three wires stretched between the two stations, by means of which 42 signals are transmitted, and an alarm given, the method of producing which is also believed to be peculiar. This may

be first explained. The galvanometer, by which the alarm is given, is distinct from those by which the other signals are produced, and is placed in the circuit of one of the wires. It consists of two coils of copper ribband, attached, and placed parallel to each other, with a space between them. Within the coils are suspended two needles, having a platinum wire terminating in a small spiral coil across the direction of the needle. Under the end of the platinum wire is placed a spiral lamp, with a small flame, by means of which the platinum coil is maintained at a white heat. When the needle deviates by means of the galvanic influence transmitted from the other end of the telegraph, it carries round with it the hot platinum coil, which meets a fine cotton thread stretched in its course. This thread is attached to a cord, by which a pendulum is drawn aside upon a bell or gong, upon which it tends to fall. The moment that the hot wire touches the thread, it burns it, and the pendulum being freed, strikes the ball or gong, and thus the attention of the person at the telegraph is called to the signal that is made. To prevent mistakes, the signals are returned at such intervals as may be agreed on, either letter by letter, or word by word: the same wire being used to return as to transmit the signal. The wires are brought into connexion with the plate of the battery, by dipping the connecting wires attached to the keys into mercury; the galvanic action thus only affecting the different needles during the time that any key is kept down. — *Mechanics' Magazine*, No. 894.

ELECTRO-CHEMICAL GILDING.

M. DE LA RIVE, of Paris, has been very successful in Gilding by Electricity. This kind of gilding is thicker and firmer than that by other means, as has been proved by the experiments to which it has been subjected by a Parisian goldsmith. A vase, gilt by this process, was heated in fire to a red heat, and then thrown into cold water; when, on being taken out, it was found to have lost nothing of its lustre.—*Civil Engin. and Arch. Journal*, No. 36.

COLOURED FILMS PRODUCED BY ELECTRO-CHEMICAL AGENCY AND BY HEAT.

MR. WARINGTON has communicated to the *Philosophical Magazine*, No. 100, an interesting paper on this inquiry, which is intended as a reply to a memoir of the late Prof. Nobili on the subject. We omit the details, and pass on to Mr. Warington's conclusions :—

"To sum up the whole of this subject in a few words, then, it appears; 1st, that the appearances called electro-chemical, are not films of oxygen and acid, but lead in a high stage of oxidation thrown down on the surface of the metal, by means of a voltaic combination acting through a medium formed by a solution of acetate of lead; 2dly, that those colours owe their varied tints to the varying thickness of the precipitated film, and that the light is reflected through them from the polished metal surface below. 3dly, that the colours produced on the surface of metals by the application of heat are owing

to the formation of thin films of oxide of the metal, in consequence of exposure to the air during the process; that this does not involve the necessity of any one oxide being always formed, as this must vary according to the affinity of the metal used for oxygen, under the influence of a raised temperature; 4thly, that the opacity of the metal is not, in the slighest degree, an argument against the transparency of the oxide, as we have both in nature and art numerous cases which place this question beyond a doubt. 5thly, That we can produce analogous appearances by substituting other elements for oxygen; such as iodine, chlorine, bromine, sulphur, phosphorus, carbon, &c."

CHEMICO-ELECTRIC ODOUR.

Prof. Schœnbein, of Basle, has presented to the British Association his Report 'On the Peculiar Odour evolved in certain Electro-chemical Decompositions.' It may be recollected that among the grants of last year, £40 were voted to Professor Schœnbein towards defraying the expenses of his research into the connexion between chemical and electrical phenomena. In the present abstract, the learned Professor described a number of experiments, with their results, which he had made in order to ascertain the circumstances under which this odour was evolved, the causes of its production, and the original principle whence its presence was to be attributed. The odour is evolved by the decomposition of water, by numerous electrolytes, and in great quantities by dilute sulphuric acid. The Professor is of opinion, that the odour which is perceptible when bodies are struck by lightning may be due to the disengagement of a portion of *Ozone;* and supports this argument from having witnessed a church recently struck, when all the surrounding objects were wrapped in a bluish vapour, and a peculiarly pungent smell affected the sense. Should the existence of this new substance, ozone, be demonstrated, it is evident that a very considerable change, as regards the science of chemico-electricity, must be produced.—*Literary Gazette*, No. 1236.

M. Schœnbein thinks that he has established by analysis an analogy between ozone and chlorine.

ANOMALOUS ELECTRIC CONDITION OF IRON.

Mr. M. J. Roberts, while prosecuting a series of novel galvanic experiments, has discovered a singular Anomaly in the Electric Condition of Iron, which is, that although iron if associated with copper as a galvanic pair, is highly positive to the copper, yet, when associated with zinc, it is more highly negative to the zinc than the copper would be under similar circumstances; or, in other words, that although copper and iron form a galvanic combination, in which the iron is in the same relation to the copper that zinc-plate would be, yet that iron and zinc form a galvanic pair that has greater power of generating electric action than a similar sized pair of copper and zinc. This singular phenomenon will, Mr. Roberts believes, lead the way to some important discoveries; and he appends extracts from his note-book of experiments.—See *Philosophical Magazine*, No. 101.

THE BLAZER STEAMER.

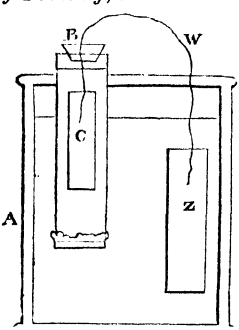
It is only about four years since this Admiralty steam-vessel was built, and her service has been principally in the Mediterranean sea. On her return to be paid off, at the end of June last, she was taken into one of the dry docks in Woolwich Dockyard, and, on being examined, was found to have her copper sheathing completely incrusted with barnacles, corallines, oysters, muscles, &c., thousands of them being alive, and, in many places, clustered several inches thick. This state of the sheathing is referable to some chemical action on the copper, which has not yet been accounted for. Perhaps, a small portion of zinc may have been inadvertently used in the sheathing, or in the nails with which it has been fastened. A very small quantity of zinc, either by mixture or contact with copper, will completely neutralize its quality of preventing the adherence of shell-fish in sea-water. Mr. Marsh, the chemist connected with the Royal Arsenal, some time ago, prepared two sheets of copper, each eight feet long by two feet broad, and had them polished with cork and sand. He then placed them in troughs of sea-water, taken from the Nore, in one of which he put a piece of zinc, about four inches square. In the course of twenty-four hours, the copper not in contact with zinc acquired a green tint, like verdigris ; the other piece of copper, with the zinc, remained in the water about four months without the slightest change, or losing any of its polish. Hence it is presumed that the copper tinted like verdigris became poisonous, and of a quality which renders that metal so valuable as sheathing for ships. The boring-worm has committed depredations in the timbers of the *Blazer*, several holes being found, some of which are through pieces nearly eight inches thick ; but this is explained by a portion of the copper sheathing having been torn off by grazing on a rock.—*Times.*

[There must have been some error in the sheathing of the *Blazer*, or in its fastening. It is not stated whether the pins were of iron or zinc; had they been of copper, although not so strong as either of the above metals, the incrustation of weeds and animals would not have taken place, but the copper would have been corroded. Probably the "Davy protectors" were employed in this case. The last experiments which engaged Sir Humphry Davy's attention to any extent, were the protection of the copper sheathing of ships by electrical combination. To this subject, Sir Humphry gave much of his time, and personally inspected all the boats and vessels on which the trials were made. He found, as Mr. Marsh corroborates in his experiments, that the copper becomes oxidized and corroded by the action of sea-water ; but that it is not thus acted upon if rendered negative by the contact of zinc or iron. A small piece of iron thus attached to the copper, protects it, therefore, from this corrosive action, and from oxidizement generally ; but it unfortunately renders it, at the same time, attractive of the electro-positive bodies in the water, such as earthy matters, which are more speedily precipitated upon its surface than they otherwise would be, and give it a coating which prevents corrosion : but this is very favourable to the attachment of weeds and animals, and these render the protected bottoms so foul as to interfere

with the sailing of the vessels. Although the practice founded upon Sir Humpry Davy's ingenious theory proved unsuccessful, yet it was satisfactory to him, as it pointed out the course of remedy necessary to be adopted; for it is only by the electric influence of certain metals when in contact, that chemical action can be prevented. Alloys of copper have been proposed, but they do not possess the requisite tenacity and elasticity.]—*Abridged from the Literary World*, vol. iii.

THE ELECTROTYPE.—VOLTAIC PRECIPITATION.

A BRIEF notice of this elegant process of Engraving by means of Voltaic Action, will be found in the *Year-Book of Facts*, 1840, p. 140-1: with an especial reference to Mr. Spencer's process. In addition to this gentleman's Pamphlet, published in September, 1839, containing directions for constructing the necessary apparatus, he has contributed two letters to the *Athenæum*, (Nos. 651 and 662) and the *Mechanics' Magazine*, (No. 884,) detailing various modifications and improvements, too numerous for quotation here. We prefer abridging an account of the process, which has been adapted concisely, yet satisfactorily, by Mr. Savage, in Part 6 of his *Dictionary of the Art of Printing*, now in the course of publication.

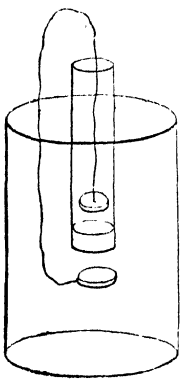


The annexed figures and explanation afford an example of the action of a voltaic apparatus, and will be sufficient to render the subsequent details intelligible. A, is a vessel filled with a solution of common salt, which is a compound of chlorine and sodium; B, is a tube immersed therein, closed at the lower end with a piece of bladder stretched over and firmly tied; which tube is filled with a solution of the vitriol; that is, a compound of sulphuric acid and oxide of copper. A plate of copper, C, and one of zinc, W, are immersed in the above fluids. The zinc decomposes the salt, with the chlorine of which it unites, forming chloride of zinc, while the sodium of the salt is repelled, and passing through the bladder, enters the solution of sulphate of copper, which it decomposes, uniting with the sulphuric acid and oxygen to form sulphate of soda, and setting free pure copper in the form of beautiful crystals, which are deposited on the plate C. The connecting wire, W, serves to convey electricity from C to Z, and thus the action is maintained so long as any common salt and sulphate of copper remain undecomposed.

Mr. Spencer's first attempt was made with a piece of thin copper plate, covered with a cement of bees'-wax, resin, and Indian or Calcutta red. The plate received its coating while hot, and on becoming cool, the experimenter scratched the initials of his name upon the plate, being careful to clear away all the cement from the scratches, so as to expose the copper below. A piece of zinc was attached to this

plate by a copper wire, and the voltaic current was set in action by means of the simple apparatus shown in fig. 2.

A represents a vessel of convenient form. B, a gas glass stopped at the lower end, P, by a piece of plaster of Paris, to the depth of three-quarters of an inch. Z, a plate of zinc, and C, a similar piece of copper, a coin, or any other metallic substance to be acted upon; and these two are connected by a copper wire, W. The inner vessel may be kept in its place by a cord. A solution of sulphate of soda is poured into the gas glass, and the wire connecting the zinc and copper figures being bent, as shown in fig. 2, the zinc plate is immersed in the solution of sulphate of soda, and the copper plate into the solution of sulplate of copper.



In a few hours, Mr. Spencer found that the portion of the copper rendered bare by the scratches was coated with the pure bright deposited metal, while those portions which were still covered with cement, were not acted on. It now became an important inquiry whether the deposition would retain its hold on the plate, and whether it would be of sufficient solidity to bear working from; that is, supposing an etching or engraving to be made, and the lines to be afterwards filled up with copper by the voltaic process, whether such lines could be printed from.

To answer this last question, Mr. Spencer coated with cement a piece of copper, and with a steel point endeavoured to draw lines in the form of network, so as to penetrate the cement and expose the copper. After this plate had been exposed to the voltaic action, anp then heated, so as to get off the covering of cement, the copper network came off with it. This happened many times; but by an accident it occurred to the experimenter to employ nitric acid to the plate, after it had been cemented and engraved on as before. It was then subjected to the voltaic process for forty-eight hours, when the lines were found to be entirely filled with copper. On applying heat, and then turpentine to get off the cement, it was found that the voltaic copper had completely combined with the plate on which it was deposited.

A plate was then coated with cement, and being engraved on with a sharp point, had the copper deposited on the lines; and this was printed from successfully.

This was an attempt to deposit lines upon a plate of copper by the galvanic action, and thus form an engraving in relief, which Mr. Spencer has doubts of being successfully practised with finished subjects.

The application of heat separates the two metals, in consequence of their different expansibility when subjected to its influence.

Mr. Spencer likewise gives an apparatus, to be employed in large works.

M. Bachoffner has likewise experimented in *Electography*, with great success, at the Polytechnic Institution, in Regent Street; and has contributed to the *Polytechnic Journal* (October), a very interesting account of the process.

Mr. E. Solly, jun., has likewise contributed to the *Philosophical Magazine*, No. 103, a practical paper on this very attractive subject; in which he proposes a simple and cheap form of apparatus, which, he believes, has an advantage over that first proposed by Mr. Spencer, in the vertical position of the mould. (See page 311, *Philosophical Magazine*, ut ante.)

Another paper, "On the Production of Electrotypes," has been contributed by Mr. Smee to the *Philosophical Magazine*, No. 105; containing some trifling differences, which Mr. Smee considers to be very important in practice. In this paper, the author describes "a mode of making a copperplate engraving without an engraving in the first instance." First, draw the required subject upon a smooth copper plate, with any thick varnish or pigment insoluble in water, and then expose the plate in the usual way to the influence of the current, when first copper will be thrown down upon the uncovered parts and will gradually grow over the drawing, and the electrotype, when removed, will be ready for printing. Very thick oil paint should be used, else sufficient depth will not be obtained to hold the ink. As an additional advantage to its cheapness, this method does not require the artist to reverse the design. An opposite effect to this may be produced by placing a piece of copper similarly drawn upon at the oxygen end of the battery, when the metal will be acted upon, leaving a drawing in basso-relievo. In a note, Mr. Smee adds, that Prof. Steinhill, of Munich, is applying this process for making a cast in copper, from a composition by the celebrated sculptor, Schwanthauler, representing the labours of Hercules, and containing 140 figures.

To this process, Prof. Jacobi has applied the term *Galvanoplastics*; he has likewise received from the Emperor of Russia the sum of 25,000 silver rubles for his discovery, on condition of his publishing a detailed account of the process, the necessary illustrative drawings, applications, &c.

Prof. Robell, of Munich, denominates his modification of the process, *Galvanography*; by which he is enabled to engrave copperplates, the impressions of which resemble drawings in Indian ink, or sepia; and his process has been submitted to the Academy of Sciences at Paris, by M. Brongniart.

Chemical Science.

THEORY OF CHEMICAL SUBSTITUTION.

On Feb. 4, M. Dumas read to the Academy of Sciences, at Paris, a memoir on his "Theory of Substitution," on which so animated a controversy has been carried on between this eminent chemist and the followers of the school of Berzelius. The theory of Dumas, as based on his experiments, may be thus summed up: "All chemical substitutions take place by means of equivalents: but two cases occur; either the substances are *substituted* for each other, or else they are *displaced* by each other. In the former, the product retains its original type and molecular form; in the latter, it preserves no chemical analogy with the composite substance from which it proceeds, and it changes its molecular form." Hence, M. Dumas infers that some reactions by substitution between chemical substances are more common, more easy, and less liable to alteration, than those by displacement: it is possible to determine beforehand the properties of the composite substances that may be produced. Then, while the theory of equivalents can only enumerate those combinations which are *possible* between given substances, the theory of substitutions can foresee the combinations that are *necessary;* and this M. Dumas considers to be a result of inappreciable importance to the progress of chemical knowledge. A change in chemical nomenclature is said by M. Dumas to be a necessary consequence of this theory: and he declares that the actual system, founded, in great part, on the discoveries of Lavoisièr, is inadequate to the actual state of chemical knowledge.—*Literary Gazette*, No. 1204.

CHEMICAL ERRORS.

Professor Erdmann has demonstrated that the statements of Dr. Golding Bird and Mr. Brett respecting the presence of titanic acid in Hessian crucibles is incorrect, and that they had mistaken impure silica for that substance. M. Marchand has also refuted the experiments of Dr. G. O. Rees, who affirmed that he had detected titanic acid in the blood, mistaking silica for that acid. The form of silica, which deceived these gentlemen, is familiar to practical chemists.—*Athenæum.*

ORGANIC ANALYSIS.

The following new mode of conducting Organic Analysis, explained by Prof. Bunsen to the British Association, gives results of great accuracy, and closely agreeing with theory. The subject of the analysis mixed with oxide of copper, and with a few pieces of metallic copper in addition, is placed in a glass tube, and affixed to Dobereiner's apparatus for generating hydrogen. After the complete expulsion of atmo-

spheric air, the tube, then hermetically sealed and immersed in an iron vessel of moist gypsum, is subjected to the usual analytical process of heat; and, after complete combustion, the tube with its contents is placed under a graduated receiver, in which is a ball of hydrated potash, and over mercury, with the point broken off. The result is the absorption of the carbonic acid by the potash, the conversion of the hydrogen into water by the oxygen of the oxide of copper, and consequently, the detection of the proportion of the remaining free nitrogen. —*Literary Gazette*, No. 1240.

NEW TEST LIQUOR FOR ACIDS AND ALKALIES.

THE thanks of the Society of Arts have been voted to Mr. J. Marsh, of the Royal Arsenal, Woolwich, for his communication of the following New Test Liquor for Acids and Alkalies.

The infusion of the common red cabbage has been long in use in the chemical laboratory, as a test to distinguish acid from alkaline bodies when in solution; and, although possessed of great delicacy in this respect, is still subject to an objection, on account of its becoming so exceedingly offensive in its smell, after having been prepared a few months.

In order to obviate this objection, Mr. Marsh undertook some experiments, about two years ago, on the colouring matter of the dark red hollyhock, the purple radish, and the dark red beetroot; but, during his experiments, he found many objections to all. The beautiful blue colour of the dark red hollyhock, obtained by alcohol, is, however, worthy of notice; but Mr. Marsh's attention was forcibly drawn to the beautifully coloured infusion obtained from the dark varieties of the dahlia, such as the Conqueror of Sussex, Sir Edward Codrington, Sir E. Sugden, Alman's Splendidissima, Parson's Rival, Brown's Ion, Holmes's Rival, Sussex Lima, Metropolitan Perfection, Pasha of Egypt, Robert le Diable, and Sambo,—these being the varieties mostly employed.

This infusion is easily obtained as follows:—Into an infusion pot, or any common earthen vessel, let as many of the petals of the above-named dahlias be lightly pressed, and then boiling hot distilled or good rain-water, sufficient to cover the petals about an inch, be introduced. The best method of keeping them down is by means of a piece of plate-glass, or the foot of a broken tumbler, or even a piece of common porcelain will do very well. The whole may be kept on the hob of a common fireplace, simmering for two or three hours, covered over with a piece of common paper, to keep out any dirt which otherwise might fall in. The liquor is then to be poured off the petals, which will be found almost colourless. To every pint of the infusion, add half an ounce of sulphuric acid, keeping the whole slowly stirred with a slip of glass. When quite cold, add to every pint of the mixture two grains of corrosive sublimate dissolved in a portion of the liquor: filter the whole through a piece of coarse cloth, and bottle it up; and it is immediately fit for use.

When wanted for use, the liquor is to be carefully neutralised by ammonia, which gives it a kind of olive colour, and in this state it may be used liquid; or bibulous paper may be dipped in it, and then dried.

Either the liquor or the paper will become green with alkalies, and red with acids.

Being desirous of turning to account some of the qualities of this class of flowers now so much cultivated and so generally admired, and also rendering them useful as well as ornamental, Mr. Marsh has made several attempts to fix it as a dye-stuff on cloths, &c.; but has not yet succeeded in his attempts to his own satisfaction.

This test liquor has been approved of and adopted at the Royal Military Academy and Royal Institution.—*Transactions of the Society of Arts; abridged.*

NEW COMPOUND.

Dr. Kane, M.R.I.A. states, that a new Compound of Ferrocyanide of Potassium with Cyanide of Mercury, is most easily prepared by dissolving together in a moderate quantity of water, about one part of ferrocyanide of potassium in crystals with two of cyanide of mercury. On cooling, the new salt separates in the form of rhomboidal plates of a rich yellow colour, almost as deep as that of ferrocyanide of potassium. When heated, these crystals lose some water and become whitish and opake, then blacken and yield cyanogen and mercury; the usual products of the decomposition of ferrocyanide of potassium remaining behind.

With a protosalt of iron, a solution of this new compound yields Prussian blue; indeed, every reagent which acts on either constituent, gives its characteristic reaction with this new body.

The existence of this new salt is of considerable practical importance, as it shows the necessity of avoiding any excess of ferrocyanide of potassium in preparing cyanide of mercury; an error into which, from motives of economy, the manufacturing operator would be peculiarly liable to fall.—*Abridged from the Philosophical Magazine*, No. 101; which see for analysis, &c.

FERRO-SESQUICYANURET OF POTASSIUM.

Mr. A. Smee has examined the action of chlorine upon the ferrocyanate of potassa, and the conversion of the latter into ferro-sesquicyanuret; and proposes methods for obtaining this latter salt uncontaminated with impurities, and free from the difficulties and inconvenience attendant on the present mode of preparation.—*Philosophical Magazine*, No. 111.

Mr. A. Smee, in a paper read before the Royal Society, on June 18, "On the Ferro-sesquicyanuret of Potassium," after detailing the various processes by which this substance can be prepared, states that with peroxide of manganese and the galvanic current, it may be made of absolute purity. This last mode will, probably, supersede entirely every other mode of preparation, as with a galvanic battery a large quantity can be readily made.—See *Philos. Mag.* No. 109.

NITRITES FORMED BY DIRECT COMBINATION.

M. J. Fritzche forms these salts by passing nitrous acid, procured

from the action of nitric acid upon starch, into water containing finely divided oxide of lead; the oxide is quickly converted into a white mass, which, on continuing to pass the nitrous acid gas into it, completely dissolves. The deep yellow solution thus obtained, yields by evaporation with a gentle heat a considerable quantity of nitrite of lead in yellow silky scales. A very small quantity of nitrite is formed in this operation; wherefore, nitrous acid can, doubtless, combine directly with bases.—*L'Institut; Philosophical Magazine*, No. 108.

MANUFACTURE OF CHLORATE OF POTASH.

M. Pelouze has communicated a new and advantageous mode of preparing Chlorate of Potash. Hitherto, carbonate of potash has always been decomposed by chlorine: M. Pelouze describes the inconveniences of this process, which he proposes to remedy by substituting soda for potash; by this chlorate of soda and common salt are obtained, and the chlorate of soda is converted by double decomposition into chlorate of potash by one of the cheap salts of potash which occur in commerce.

M. Pelouze also proposes to pass chlorine into milk of lime, by which chloride of lime is obtained, and this is then decomposed by chloride of potassium.—*L'Institut: Philos. Mag.* No. 102.

NATIVE SULPHATE OF MAGNESIA.

Indiana, one of the United States, contains a great number of grottoes; one of these, near the Ohio, is celebrated for the masses of Epsom Salt which are found in it. The mountain in which it is placed is 400 feet high, and is formed of limestone. One of the most beautiful objects in this grotto is a magnificent white column, of carbonate of lime, 15 feet in diameter, and 30 feet high, which, reflecting the light of visitors' torches, has a dazzling effect.

The date of the discovery of this grotto is not certain: it is known only that it was visited in 1807 by some persons, who found in it a bed of salt from 6 to 9 feet thick on the floor, where they observed enormous blocks scattered over it, whilst the walls were covered with saline products. The sulphate of magnesia abounds here in different forms, and sometimes in masses of one pound to ten: it also lines the walls at various distances; and, if it be removed, it is reproduced in four or five weeks in needle-form crystals. The poorest earth which has been washed gave 4lb. per bushel, and the richest from 20 to 25lb. The salt which next occurs, in the greatest quantity, is nitrate of lime, and afterwards nitrate of alumina, which yields as much nitrate of potash as the nitrate of lime. Sulphate of lime also occurs, with traces of sulphate of iron and of carbonate and nitrate of magnesia. The sulphate of magnesia is not pure, as will be readily conceived.—*Journal de Chimie Méd.*; *Philos. Mag.* No. 102.

FLUORINE.

Mr. G. J. Knox, A.M. & M.R.I.A., from some recent researches, submitted to the Royal Irish Acadamy, concludes Fluorine to be, when

obtained in an insulated state, a colourless gas, possessing properties analogous, in all respects, to those of chlorine; having, like it, strong attractive powers for hydrogen and metals, but inferior to it in negative electrical energy.

CHROMIC ACID.

M. J. FRITZCHE prepares Chromic Acid by the careful addition of concentrated sulphuric acid to a hot concentrated solution of bichromate of potash; a crimson bulky precipitate is obtained, which is dried first by heat, and afterwards *in vacuo*. This is entirely chromic acid, which is to be washed, to get rid of the mother-water, and of the sulphuric acid, which adheres to it. The author could not obtain the compound of sulphuric and chromic acids described by M. Gay-Lussac in the 16th volume of the *Ann. de Chim. et de Phys.*, and he is inclined to question its existence.—*L'Institut*, No. 341; *Philosophical Magazine*, No. 109.

NEW PROCESS FOR MAKING SULPHURIC ACID.

M. PROVOSTAGE, of Paris, recommends introducing into the leaden chamber, sulphuric acid, nitric acid, and the vapour of water. To understand what takes place under these circumstances, a current of sulphuric acid may be passed into a flask containing nitric acid: this should be made by means of a bent tube, to communicate successively with a flask containing sulphuric acid, a globular vessel moistened with water, and a dry globe. The nitric acid is completely decomposed. The first flask contains pure sulphuric acid alone. Red vapours pass from the first vessel into the second; this is filled with sulphurous acid also, for it is formed of solid white crystals, in the two last experiments, as in the first. In the latter, all the sulphuric acid of the second flask exists in a solid crystallized greenish yellow mass. The reactions are, therefore, similar to those of the old process. In the new process, the nitric acid yields a portion of its oxygen to the sulphurous acid, in order to convert it into sulphuric acid. Hyponitric acid is thus formed, which acts like the hyponitric acid in the old process, which is formed from the binoxide of azote and oxygen of the atmosphere; that is to say, successively it yields oxygen to the sulphurous acid, and borrows it from the air; but the discharge requires the intervention of sulphuric acid and water. The water has two very distinct functions: it acts directly, by bringing into more intimate contact the sulphurous acid and hyponitric acid, and this favours the oxidation of the first by the oxygen of the second; it acts also by decomposing the white crystals immediately, and changing them into sulphuric acid and oxide of azote.—*Athenæum*, No. 669.

TESTS FOR SULPHURIC ACID WHEN THROWN ON THE PERSON.

DR. THOMSON, in a paper on this subject, read to the British Association, observes, that "the usual methods of inferring that free sulphuric acid is present in hats and clothes, he has found to be exceedingly liable to fallacy; and this was particularly instanced in the

case of the hat of the person upon whose face a quantity of sulphuric acid had been thrown for destructive purposes." He found that a portion of the hat which had been uninjured contained sulphuric acid, as well as that portion which was injured. The solution of both possessed an acid reaction, and the question came to be, Was the acid in either case free or combined? The author showed there to be only one way of determining to demonstration the presence of free or combined acid, viz. by a quantitative analysis—by first weighing the acid contained in the entire hat, and then that contained in the injured hat. The excess of the one over the other might be considered as free acid.

The usual methods of proving the presence of neutral sulphates by boiling them with carbonate of lead, and concluding that if sulphate was formed free sulphuric acid was present, he showed experimentally to be quite fallacious; because sulphate of soda, potash, &c., decompose sulphate of lead. The author also showed, that wherever oil of vitriol occurs, we may expect to find nitric acid, because all the acid of commerce contains nitric acid. The presence of the latter acid can be only detected, in his opinion, by its property of dissolving gold and platinum, when mixed with muriatic acid. The test of morphia he considers liable to produce great mistakes, as pure morphia gives no reaction with nitric acid; and the only change produced is when the morphia is accompanied with resin—that is, has been prepared pure.—*Literary Gazette*, No. 1239; *abridged*.

NEW CHLORIDE OF CHROME.

THIS modification of Chromic Chloride, insoluble in water, and of the greatest beauty, is obtained by heating strongly a mixture of the oxide of chrome and charcoal in a current of chlorine. There sublimes immediately a body of a scaly or crystalline, lamellar texture, of great splendour and magnificent colour. This form of chloride of chrome undergoes no change by exposure to air. Sulphuric acid does not decompose it; it may be heated, when covered with this acid diluted, without change; the dilute acid may be evaporated, and the concentrated acid may be vapourized and distilled without decomposing the chloride. By heating it in the air, it is transformed, like the other forms, into the oxide of chrome, with a disengagement of chlorine.—*Annales des Mines; Mechanics' Magazine*, No. 894.

ATOMIC WEIGHT OF CARBON.

MM. DUMAS & STAS have, by their long and laborious series of experiments, brought us to the Atomic Weight indicated by Dr. Prout, who had long supposed that the atomic weight of charcoal was exactly equal to six times that of hydrogen, or $12{\cdot}5 \times 6 = 75$, which is the number given by the mean of our results. If, as believed by Prout, and as now appears very probable, all atomic weights are multiples of that of hydrogen by whole numbers, there will be many things to rectify in the atomic weights at present adopted. Future experiments will determine this point; but it is evident that they must be submitted

to a serious verification. — *L'Institut*, No. 347; *Philosophical Magazine*, No. 112, which see for details of the results.

COMPRESSION OF GAS.

M. SEGUIN has read to the Academy of Sciences, at Paris, a memoir on the Compression of Gases, and on the reduction of variable pressures into regular pressure; in which is described a new pump, with a regulating apparatus, for the compression of gas for illumination, obtained from the distillation of animal snbtances. This pump is so arranged as to give the maximum force at the moment of the course when the gas presents the maximum of resistance by the diminution of its volume; to work in a vertical position without loss of gas, and without the piston being immersed in fluid; and lastly, to avoid, by means of a particular mode of transmitting power, the use of guides, which would cause a friction in the piston rod.

NEW MODE OF PREPARING MORPHIA.

DR. MOHR, of Coblentz, has communicated to the British Association this new process, which Dr. Gregory considers to be the best yet proposed, both for preparing small quantities and for class experiments. The principle of this new method consists in dissolving the morphium in caustic lime by means of heat, and precipitating the filtered liquor by muriate of ammonia. The lime is neutralised by the muriatic acid of the salt, ammonia set free, and the morphia precipitated. In this process, the morphia is obtained in a crystalline and very pure state, without the alcohol. The mode of operation is as follows:—The opium is dissolved in boiling water and strained; this operation repeated twice, the liquors concentrated by evaporation, boiled with caustic lime, strained again, and mixed while hot with powder of sal-ammoniac.—*Literary Gazette*, No. 1237.

OXIDATING POWER OF GLASS FOR METALS.—ANCIENT GLASS.

MR. G. J. KNOX, in a Note to the Royal Irish Academy, "On the Oxidating Power of Glass for Metals, and on the want of Transparency in Ancient Glass," details certain experiments, whence it appears that glass, at high temperatures, not only has the property of oxidating the metals, and forming a chemical compound with the oxide, but, moreover, when the chemical affinity is satisfied, of dissolving the oxides, and probably the metals themselves when in a state of fusion; the latter, on the cooling of the glass, being deposited in globules throughout its interstices; at least, the appearance presented by the glass seems to favour such an opinion.

"The colours produced by the fusion of metals with glass, being different in many cases from those obtained when their oxides were employed, and presenting the dull untransparent appearance which is so remarkable in ancient glass, led the author to suppose that the ancients did not employ any colouring matter unknown at the present day, but that, being unacquainted with the mineral acids, they employed the metals either in the metallic state, in filings, or else in an

imperfect state of oxidation." To determine the probability of this conjecture, Mr. Knox selected three specimens of mosaic glass analysed by Klaproth; and substituting for the oxides, in the same relative proportion, the metals in a minute state of division, he obtained coloured glasses of nearly the same colour as the mosaics, while the colours produced when the oxides were employed were not only perfectly different, but the glasses were clear and transparent.*

Colours used by the Artists of the Middle Ages for Painting on Glass.

M. Vigné has published the following results of his experiments and inquiries on the composition of the colours of ancient stained glass:—

General Fuse.—Litharge or minium, 5; fine sand, 1; borax, from ·5 to 1·5.

Ochre Tint, or Yellow.—Subsulphate of iron, 1; fuse, 5; oxide of zinc, 1.

Dark Ochre Tint.—Subsulphate of iron, slightly calcined, 4; oxide of zinc, 1; fuse, 4·5.

Flesh Colour.—Peroxide of red iron, obtained by calcination of the sulphate, 1; fuse, 2.

Blood Red.—Peroxide of iron, ditto, 1; fuse, 3.

Violet Red.—Oxide of iron, flesh colour, calcined, 1; fuse, 3.

Light Brown.—Subsulphate of iron, calcined, 1; black oxide of cobalt, 1·5; fuse, 5.

Dark Brown.—Oxide of iron by ammoniac, 1; oxide of zinc, 4; fuse, 4. By substituting for the zinc 1·5 of oxide of cobalt, the brown is converted into a black.

Light Grey.—Subsulphate of iron, 1·5; fuse, 4; oxide of zinc, 1; black oxide of cobalt, 1·2. This has to be fried and pulverised.

Blue Grey.—Fuse, 5; oxide of zinc, 2; oxide of cobalt, 1. This mixture has to be melted and run.

Brown Black.—Oxide of iron, 4·5; oxide of copper, 1; black oxide of cobalt, 1; fuse, 8; oxide of manganese, 2. This has to be well pounded and slightly roasted.

Blue Black.—Ditto ditto, with ·5 of oxide of cobalt, and ·5 of oxide of copper added.—*Paris Letter; Literary Gazette*, No. 1241.

HYALITE.

M. Babinet states that Hyalite cut in any direction into plates with parallel faces, and brought between two crossed tourmalines, depolarizes light completely; by which character it is distinguished from milkopal and Mexican fireopal.—*Jameson's Journal*, No. 56.

DAVIDSONITE.

This so-called new species, found in the granite of Aberdeen, turns out to be a mere variety of beryl, as is shown by an examination of its mineralogical character and chemical composition.—(Poggend.)—*Jameson's Journal*, No. 56.

* See Glass-Painting, pp. 42 and 43 of the present volume.

DYSODIL.

THIS mineral, arranged in systems of mineralogy under the name of *Foliated Mineral Pitch*, Ehrenberg has shown to consist of bitumen, or mineral pitch, mixed with siliceous shells of infusoria, and occasionally with pollen of pines, &c. The wax-yellow variety is found in Sicily, and is made up of shells of *Naviculæ* and mineral pitch: the nearly brown coal of the Westerwalde is a variety of Dysodil; so also is the foliated leather-like bituminous coal of the Geistinger Busch at Rott and Siegburg in the Siebengebirge, and a foliated brown coal of the Vogelsberge. Hence, the numerical species named dysodil appears to be a polir-slate impregnated with bitumen. Its colours are black, brown, or black. It never forms very thick beds, but sometimes widely-spread deposits. It is used as fuel.—*Annals Nat. Hist.*

GOLD IN FRANCE.

ON July 27, M. Becquerel read to the Academy of Sciences, at Paris, a Memoir on the auriferous sands found in the lead (galena) mines of St. Santin, in the Cantal. The precious metal existed in a very small proportion, being only $\frac{1}{1000 \cdot 25}$th part of the silver, which was $\frac{45}{100}$ per metrical quintal (221½ lbs. English) of the total weight of the lead. After the sand had been properly treated for contracting the particles of gold, it was found that the materials of the sand were nearly the same as those of the auriferous sands of Brazil and of Asia.

IMPORTANT DISCOVERY IN METALLURGY.

AT a recent sitting of the Academy of Sciences, at Paris, M. Becquerel read a Memoir of one of the most important discoveries of modern times, namely, the application of Electro-chemical Power to the art of Metallurgy, especially as regards gold, silver, copper, and lead. Of this paper the following is an analysis:—

The experiments relative to the application of the electro-chemical power to refining, (*metallurgie*), of silver, copper, and lead, without the aid of quicksilver, and with little or no fuel, have been continued by M. Becquerel with constant success: his operations were conducted upon a large scale, and embraced considerable quantities of ores derived from Europe, Asia, and America. The object of these researches was, in the first place, the immediate separation, *(reduction,)* of the metals one from the other, and especially of silver and of lead from galena; this operation was effected with so much rapidity, that at the preparatory foundry in Paris, four pounds weight of silver can now be drawn off in the metalled state from silver ore in the space of six hours; secondly, the preparation which the ore is to undergo, so as to render each metal capable of being withdrawn by the electric current. This preparation varying according to the nature of the ore, presents no obstacle when the silver is in the metallic state, or in the nature of a sulphate, as usually occurs in Mexico and Peru; but it becomes more complicated when the silver is mixed with other substances; the use of a small quantity of combustible matter is then indispensable in order to effect the roasting at a low temperature.

Ores are generally found in great quantities in these countries, but are for the most part abandoned, owing to the want of sufficient fuel for effecting their amalgamation, or to their being found at too great a distance from the sea to transport them to Europe, unless at an enormous expense.

In Columbia, where large masses of gold and silver ore are found mixed with zinc, the richest are sometimes exported to Europe to be fused, whilst the poorest and those of a medium quality are either rejected altogether, or used to so little advantage, that the mining companies lose by them. Exertions are now in progress for introducing the new methods, which are equally applicable to amalgamation and to the electro-chemical process.

The silver ores which are most difficult of amalgamation are those which contain a large portion of copper and arsenic. Ores of this description are found in considerable quantity, especially in Chili, where the inhabitants frequently offer them to Europeans, by whom they are sometimes taken for ballast for want of freight, and without any certainty of turning them to advantage.

The great difficulty was to be able to treat these substances in Europe so as to obtain, in separate portions, and at little expense, all the silver, copper, and arsenic they contained. This problem has just been solved in a satisfactory manner.

On inquiring into the causes of the delay experienced in working the mines in America, it will be seen that the principal ones arise from the high price of quicksilver, and the great difficulty of draining the water by which the mines are inundated. This is not the case in Asia, in the Russian possessions, which are rich in mineral productions, and yield larger profits from day to day, in consequence of the introduction of the improvements lately adopted in Europe for reducing metallic ores. In the silver mines of Altaie the expenses for extracting the ore, process of reduction, and of the establishment, do not amount to a quarter of the rough produce, although the ore in general is of slight tenacity. These advantages are owing to the moderate price of labour, the abundant supply of combustible matter and substances required in the fusion, and which are not to be had in America, especially in Mexico and the Cordilleras.

The electro-chemical process can be easily applied to the ores at Altaie; however, in countries where sufficient fuel is at hand, and salt cannot be procured, the fusing operation will be always preferred; except in cases of complex ores, which often exercise the ingenuity of metallurgists.

There are but few silver mines worked in Russia. The only mines of importance are those of Altaie, Nertoninsk, and those of the Caucasus and the Ural; but the great source of mineral riches in that kingdom consists principally of the gold and platina dust (sands), the washing of which engrosses the chief attention of the Government. This process, though methodically conducted, is very imperfect, for a large quantity of the gold contained in the sand is lost; the proceeds, however, are

—From an elaborate paper "On the Different Species of Cast Iron, Steel, and Malleable Iron;" *Philosophical Magazine*, No. 106.

BLUE OXIDES OF TITANIUM IN SCORIÆ.

In analysing the blue Scoriæ of different countries, M. Kerstern found small quantities of titanic acid, and that these scoriæ possessed a blue colour similar to that of the blue oxide prepared in the dry way: he presumed, therefore, that this colour, instead of being derived from the protoxides of iron and manganese, which sometimes occur in them, might be owing to titanic acid (oxide?) According to the facts above stated, it is very probable that titanic acid, which occurs very often in the ores of iron, after having been dissolved and scorified during the operations of the blast furnace, is reduced to the state of oxide by the fused iron, similarly to what occurs in the humid way with solutions, and as has happened in several preceding assays. If this assumption be well founded, it ought to be possible, with the substances usually contained in the scoriæ and with titanic acid, to reproduce blue glass on a small scale. M. Kersten succeeded not only in fusing together silica, lime, alumina, titanic acid, and iron, all of them pure, and in producing earthy glasses of a blue colour, resembling the blue scoriæ of iron, but also succeeded in obtaining, with the same earths, titanic acid and zinc free from iron, or with pure tin.

M. Kersten, therefore, concludes from these researches, that the blue colouring matter of many iron scoriæ is the blue oxide of titanium. This blue oxide deserves attention from its application to the arts: the author endeavours to procure blue enamels upon porcelain by using it; and though they were not so fine as those of cobalt, they most nearly approached them.—*L'Institut*, No. 353; *Philosophical Magazine*, No. 111.

MALLEABLE IRON IN PERSIA.

On March 2, 1840, was read before the Royal Society of Edinburgh, an important account of the Iron Mines of Caradsgh, near Tabreez, in Persia; and of the method there practised, of producing Malleable Iron by a single process, directly from the Ore; by James Robinson, Civil and Mining-Engineer, Major, Persian Service. We have not space for the details of the process, (for which, illustrated with engravings, see *Civil Engineer and Arch. Journal*, No. 36, p. 296,) but abridge the results:

"At a single smelting, one hearth generally affords about 30lbs. of malleable iron, to produce which there is only required about double that quantity of ore, and three times the weight of charcoal. One smith, with his assistants, will make about three or four smeltings in one day, or 1 cwt. This *yield* is in a high proportion to the material used. In England, about 4 tons of raw ore and about 8 tons of coal are required to produce 1 ton of bar-iron; while by the process described in the above-mentioned paper, the same quantity of iron, of a much superior quality, is produced in Russia, from less than half of these materials. The greater productiveness is, no doubt, in a considera-

ble measure, owing to the superior richness of the Persian ores, and the use of charcoal; but the simplicity of the process must also have a considerable share in diminishing the waste of materials; for the roasting, smelting, refining, puddling, shingling, balling, and drawing-out, or something very similar, is all there effected at one heat, and in a very few hours.

"The rich iron ores of Cumberland and Lancashire, and many others in Britain, particularly the black-band ironstone of Scotland, which has so recently attracted the attention of iron-masters, if manufactured in the same manner, would, undoubtedly, create a great saving in time, labour, capital, and materials.

"On the Styrian frontier, and in the central parts of Asia Minor, the iron ores are of the richest description; and the method pursued there is still more simple then in Persia; as the furnaces are in the form of a small cupola, and the fuel is simply dry wood."

In conclusion, the author draws attention to the fact that Malleable Iron can be made directly from the ore, although a contrary opinion is prevalent in England.

BLACK BAND IRONSTONE OF SCOTLAND.

On March 7, Mr. R. Bald, Mining-Engineer, read to the Wernerian Society, an account of the Black-band Ironstone of Scotland, now in such great demand for the production of cast-iron; although, less than forty years ago, it was thrown on the rubbish heap as worthless. By degrees, however, it began to be sought after; and it has been ascertained to be a stratum of very general occurrence in the coal formation of Scotland. It possesses the following remarkable characters: it has carbonaceous matter enough in its composition for calcination without the aid of coals. When calcined, it has all the appearance of iron, and is very heavy; indeed, lumps of it have been taken from the heap, and immediately, in a smith's forge, made into a horse-shoe. Mr. Bald states, that with this rich ironstone, aided by the hot blast, those furnaces which used to produce 36 tons of iron a-week, now readily afford 100 tons: a few years ago, there were only 9 blast furnaces in Scotland; but now there are forty-two, and more in progress. To give an idea of the value of the Black-band, Mr. Bald mentioned, that Sir W. Alexander, of Airdrie, had let to an Iron Company a limited extent of this mineral, at the enormous rent of £12,000 per annum. It is to be regretted that Mr. D. Musnet, who, about 34 years ago, discovered this ironstone, remains almost unknown, and certainly unacknowledged by the iron-masters and mine-owners of Scotland.—*Abridged from Jameson's Journal*, No. 56.

CHEMICAL CONSTITUTION OF COAL.

Mr. C. Hood, F.R.A.S., in a paper read to the Institution of Civil Engineers, observes:—The opinion that coal is a compound of carbon and bitumen has been objected to by some chemists, on the ground that by no process hitherto pursued in analyses has it been possible to resolve it entirely into these two substances: even at a low temperature

a quantity of gaseous matter is thrown off, and at an elevated degree of heat an evident decomposition of the bitumen takes place. Even anthracite contains a small portion of volatile matter, its component parts being carbon, oxygen, hydrogen, and nitrogen; the hydrogen being either combined with the oxygen to form water, or with a small portion of carbon to form carburetted hydrogen, which exists in a gaseous state in the pores of the coal. In bituminous coal, the hydrogen is combined with a larger proportion of oxygen and nitrogen; the mechanical difference being, that the bituminous and free-burning coals (more particularly) melt by heat when the bitumen reaches the boiling point; whereas anthracite is not fusible, nor will it change its form, until it is exposed to a much higher degree of temperature. Two tables of the analyses of different coals are given from the authorities of Mushet, Thomson, Vanuxem, Daniell, Ure, and Reynault; No. 1, showing the proportions of carbon, ashes, and volatile matter, with the specific gravity of the coal and of the coke; and No. 2, showing the proportions of carbon, hydrogen, azote, and oxygen. These tables show that the largest quantity of carbon (92·87) is contained in the Kilkenny anthracite, and the least quantity (64·72) in Cannel coal; and that the nature of the volatile matter greatly affects the quantity of coke—the aggregate quantity of the gaseous products of coking, splint, and cherry coal, being very nearly similar; while the quantity of coke obtained from these different species varies more than 45 per cent. The author then points out the continual presence of azote, which quits the base with the greatest difficulty; and also the affinity of sulphur, not only for the coal, but for the coke, as it is rarely found to have been completely expelled, even from the most perfectly made coke; the only coal found to be even partially free from it being anthracite, in some species of which no traces of its presence are found.

CHEMICAL GEOLOGY.

Prof. Johnston has read to the British Association an important paper "On Chemical Geology," affording so striking an instance of that conjunction of the sciences which is so truly valuable in all useful pursuits, that it has been reported as one of the principal features of the Meeting of the Association. The very able Professor has produced much information respecting the componency of various coals, in a Report, wherein he considers: 1. The characters, classification, and constitution of the different kinds of Coal which occur in various parts of the globe. 2. The origin of Coal, which he considered to be unquestionably derived from vegetable matter. 3. He then explained the general law, according to which vegetable substances undergo decay in connexion with air and water. 4. The next point adverted to was the *relative* constitution of the different kinds of Coal, as expressed by chemical formulæ, represented in a table, wherein the two remarkable points particularly dwelt upon were:—1. That from the formulæ, the several species of Coal appear to form a series, indicating a succession of steps from the unchanged woody fibre, (lignin,) to the anthracitic coal, in which all traces of organisation have entirely disappeared.

2. That in the progress of the decomposition a point is at length reached, (see *splint coal, Willington*, in Table), when, instead of water and oxygen, water and hydrogen are evolved. Up to this point, the vegetable matter gives off, by its decomposition, water and carbonic acid only; hence, in mines of brown and Cannel coals, carbonic acid is the principal gaseous substance given off by the coal. Beyond this point, however, water and light carburetted hydrogen, (*marsh gas* or *fire damp*,) are given off; and hence the evolution of inflammable gas in the mines of certain bituminous coals, (*splint, caking coal*, &c. of the Table,) and in them only. These observations serve to illustrate very beautifully the production of the several kinds of coal, and of the gaseous and other substances obtained in connexion with it in the various coal mines. The last division of the Report was devoted to the consideration of the question as to the mode by which the vegetable matter from which the coal is formed had been derived: whether, for example, it had been brought from a distance as *drift*, or had grown on the spot? On this point, the Professor considered the *balance* of evidence, *of all kind*, to be in favour of the opinion that the vegetable matter grew on the localities in which the coal is now found.

Dr. Buckland considers the views propounded by Professor Johnston to amount almost to a demonstration, and he regards them as an epoch in the investigation of the Origin of Coal. Upon the opinions of practical men as to the formation of the Newcastle coal-field, Dr. Buckland observed—it was urged that, because there were seams of coal only one inch thick, they could not have been produced from drifted trees. But, *non sequitur*: the vegetable matter might not have been trees, but a smaller vegetable—the leaves of ferns, or aquatic plants, floated from a distant lake or forest. The argument against drifted trees might be true as far as it went; but it was not altogether true. He believed that other beds of coal were the result of vegetable matter drifted from great distances; as in the pine found in Craigleith quarry, and other fossil trees imbedded in sand, and completely cut off from the ground below. The truth, probably, lay between extreme views on both sides. For the Table of Formulæ, and further details of the discussion upon this important subject, see *Literary Gazette*, No. 1237; and *Athenæum*, No. 675.

DECREPITATING SALT OF WIELICZKA.

THIS salt is distinguished from common decrepitating sea-salt, by its decrepitating not only by heat, but even when dissolved in water: in proportion as it dissolves, bubbles of gas are emitted, which have been obviously condensed in the salt. M. Dumas has found that this, when mixed with oxygen, detonates like hydrogen; he conceives also that it may contain carbon, but as his experiments were made upon a minute quantity, they required repetition: Rose has since found the greatest quantity of gas evolved to amount to half the volume of the salt, and its composition to be nearly that of carburetted hydrogen.—*Athenæum*, No. 662.

ANALYSIS OF A MINERAL SPRING IN WORCESTERSHIRE.

On June 1, Professor Daubeny, of Oxford, communicated to the Ashmolean Society the results of an analysis which he had made of a Mineral Spring at Tenbury, in Worcestershire. The water of this spring, which is said to have considerable efficacy, both as a diuretic and as an aperient, belongs to a class of rather rare occurrence, containing common salt, with a considerable proportion of muriate of lime, and a little muriate of magnesia, but exhibiting scarcely a trace of the sulphates of soda and magnesia. The presence of muriate of lime, which exerts a powerful action on the glandular system, may probably account, in a great degree, for the efficacy of this water. But Dr. Daubeny's analysis discloses the presence of iodine and bromine, the former in a very minute form, but the latter in considerable quantities, no less than 2.60 grains to the gallon. The following appears to be the composition of the water: in one pint,

Chloride of Calcium.....	29.900 gr.
—— Magnesium	3.800
—— Sodium.....	89.600
Bromine.....	0.425
Iodine	a trace
Total.....	123.725

The proportion of bromine is greater in this than in any mineral water which Dr. Daubeny has analysed, excepting that of Ashby-de-la-Zouch, where it amounts to 4.68 grains to the gallon. And if we remember how much more powerful an agent bromine is than iodine, and are reminded that various epidemic sicknesses in the department of the Marne, in France, were attributed by the French chemist, M. Serullas, to the presence of only 1-100th portion of hydriodate of soda in the common salt used in that district, we need not be sceptical in attributing some of the virtues of this spring to so small a quantity of bromine as 1-300th part. From the statement of the Rev. Mr. Hall, the vicar of Tenbury, the spring appears to issue from the red marle.—*Athenæum.*

THAMES WATER.

A Select Committee of the House of Lords, was, on the motion of the Marquis of Westminster, appointed during the past Session, to institute a new inquiry into the question of the Supply of Pure Water to the Metropolis. One of the most beneficial results of this Committee has been the appointment of Mr. Phillips, the eminent chemist, to make an Analysis of the different Waters in and near London; and his Report establishes the fact of the Thames Water, even in an unfiltered state, containing a smaller portion of extraneous matter than the water of any of its tributaries. The following is a tabular view of the results of Mr. Phillips's investigation:—

Place where Sample taken.	Measure and Weight of Sample.	Solid Contents of each Gallon.		Total of Saline Matters in each gal. or 70,000 grs.
		Carb. of Lime.	Sulph. of Lime and Salt.	
THAMES.	QUANTITY. 1 imperial gallon.			
At Kew. Source of the Grand Junction Water Works Company ..	WEIGHT. 10lb. avoir. =70,000 grs.	16 grs.	$3\frac{4}{10}$ grs.	$19\frac{4}{10}$
Barnes. Sources of the West Middlesex Water Works Company ..	" "	$16\frac{9}{10}$	$1\frac{7}{10}$	$18\frac{5}{10}$
Chelsea. Source of the Chelsea Water Works Company.....	" "	$16\frac{5}{10}$	$2\frac{9}{10}$	$19\frac{5}{10}$
Otter's Pool — Spring near Bushey.....	" "	$18\frac{8}{10}$	$2\frac{5}{10}$	$21\frac{3}{10}$
Main Stream of Valley that supplies the Colne.....	" "	$19\frac{3}{10}$	$2\frac{5}{10}$	$21\frac{8}{10}$
Colne—near Bushey Mill	" "	$18\frac{1}{10}$	$3\frac{2}{10}$	$21\frac{3}{10}$

It also appears that the impurities of the Thames Water are so largely diluted by the upland water, as to be partly deposited and partly diffused through the volume, until the river reaches London; where, being filtered, the Thames Water is even purer than that procured immediately from a spring.

POND GAS.—AGENCY OF WATER.

M. PERSOT states that the formation of Pond Gas has served him as a means of discovering the mysterious Agency of Water in the reactions of organic bodies. By this decomposition of water, he explains the conversion of starch into sugar, that of sugar into alcohol, and that of certain immediate principles into essential oils; and he also conceives that he can reduce to the same order of phonemena, (that of oxidizement,) the action of nitric acid and hydrate of potash on sugar, which, as is well known, is converted by both of these agents into oxalic acid. —*L'Institut*, No. 323; *Philosophical Magazine*, No. 103.

PREVENTION OF DRY ROT.

SIR W. BURNET'S process for this purpose consists in applying a solution of Muriate of Zinc to the cloth or other substance to be prepared. It is much cheaper than where preparations of mercury are used. Dr. Reid has exhibited to the Society of Arts for Scotland, two sets of specimens of soldiers' cloth, sail-cloth, ropes, &c., which

were kept a year in one of the dampest cellars in Somerset House, the one being in their natural state, and the other impregnated with the Muriate of Zinc; and while the former were quite rotten, had lost their colour, and were easily torn to fragments, the latter were as fresh in colour, and strong in texture, as when they were put in.—*Jameson's Journal*, No. 59.

NEW MODE OF EXTINGUISHING FIRES.

Mr. E. W. Wells, of Cheltenham, has invented two plans for Extinguishing the largest Fires in a very short time. After explaining that common combustion cannot be supported without a supply of oxygen, he states that his first plan of extinguishing fires consists in shutting out the supply of oxygen by the following means:—"For instance, iron plates with a wet incombustible compressible substance projecting from the edges, might be erected against the window and doors, and sustained by inclined poles; the oxygen of the interior of the house being only one-fifth of the whole air, would be immediately absorbed, and none in addition being admitted, the combustion would inevitably cease." The lecturer, by means of lighted candles placed in a large glass vessel, proves the correctness of this theory. The next plan was to suffocate the flames by carbonic acid gas. He recommended the construction of a large machine, capable of containing one ton of carbonate of lime, a proper proportion of water, and about half a ton of sulphuric acid; the contact of these materials being regulated by valves and tubes, an immense quantity of carbonic acid gas could be generated and conveyed by its own pressure to the interior of the house; combustion could not then for a moment exist.—*Abridged from the Inventor's Advocate.*

KALSOMINE.

This new and inodorous sort of paint has been invented by Miss Fanny Corbaux. The materials of which it is composed are at first soluble in water; and while in this state admit of the design being effaced, or a portion of the colouring of a wall or ceiling being removed, if necessary; a subsequent operation renders the paint insoluble, by a chemical change of the properties of the material, which fixes the colour durably. It is free from any offensive smell, dries in a few hours, is not acted upon injuriously by atmospheric influences, and is said to be more durable than oil paint, as well as more agreeable to the eye, and not at all prejudicial to the health; indeed, a room painted with it one day, may be inhabited the next. It may also be made applicable to easel-painting.—*Athenæum*, No. 660; *abridged*.

ARTIFICIAL PREPARATION OF SUGAR.

1. Sugar, similar to that of grapes, may be prepared by boiling one part of the starch of potatoes or flour, with from $\frac{1}{100}$ to $\frac{1}{10}$ of sulphuric acid, and four parts of water, for 36 or 40 hours, care being taken to renew the water as it evaporates. At a higher pressure and temperature, the change may be effected more rapidly with a smaller quantity

of acid. The excess of acid is then to be saturated with lime, the sulphate of lime separated, and the liquid concentrated by sufficient evaporation. 2. The starch of flour soon loses its gelatinous consistence, when moistened with an extract of sprouted barley; it is transformed into a liquid, and if the barley is in sufficient quantity it is changed in the course of a few hours into sugar or grapes, provided the temperature be maintained at 158° to 167°. Six parts of barley which has germinated produce 25 parts of sugar of grapes. 3. Grape sugar may also be prepared from wood sawings; it may also be procured by taking 12 parts of linen rags, or paper cut into small pieces, mixing them intimately and gradually with 17 parts of concentrated sulphuric acid, or with 5 parts of sulphuric acid, and 1 part of water: the temperature must be kept moderate. After 24 hours, the mass is to be dissolved in a quantity of water, and boiled for ten hours; it is then to be neutralized with chalk, filtered and evaporated to the consistence of syrup, and crystallized. Chemists have not yet been able to obtain Sugar prepared by these artificial methods in regular crystals like cane-sugar, although there is little doubt that these two species differ from each other merely in the quantity of water with which they are combined.—*Athenæum*, No. 669.

ARCHIL AND LITMUS.

On June 4, Dr. Kane, M.R.I.A., presented to the Royal Society "Contributions to the Chemical History of Archil and Litmus." The objects of the author's inquiries are, 1. To ascertain the primitive form of the colour-making substance in a given species of lichen, and trace the stages through which it passes before the colouring substance is developed; 2, to determine the nature of the various colouring substances which exist in the Archil of commerce; 3, to examine the colouring materials of ordinary Litmus. For the details of this paper, see the *Proceedings of the Royal Society*; or *Phil. Mag.* No. 110.

NEW DYEING DRUGS.

On March 7, Mr. E. Solly read to the Asiatic Society, a Report "On a Series of Dyeing Drugs, from the Punjâb and Mysore." The new and unknown ones were as follow:—*Capilly*, a red powder obtained from the fruit of the *Rotolera tinctoria*, and which is used in India by the natives for dyeing silk of a pale orange colour. The colour is of a resinous nature, and might, perhaps, be employed in colouring varnishes or lacquers. *Maddi Chickha*, the bark of a species of Morinda, from Mysore, and there employed for dyeing calico red: the colours which it produced were dingy; but it appeared likely to be useful for some other colours. *Poppli Chickha*, a red dye-wood, also from Mysore, containing abundance of a rich, brown-red colour, which, by the action of an alkali, becomes of a fine carmine tint: it forms a good colour on calico, with tin or aluminous mordant. This and the preceding dye are very cheap and abundant. *Maen*, or *Saklur*, a substance used in India to mix with cochineal to heighten the colour. It is a very astringent substance, containing much tannin

and gallic acid. It precipitates the animal part of cochineal; and likewise acts slightly on the colour, from the acid which it contains; but it does not otherwise seem to brighten the colour. It might be used advantageously as a substitute for galls, provided its price permit, as it dyes a good black with salts of iron, and makes an excellent ink. *Hurda* and *Tarikay*, varieties of Myrobolans, the fruit of certain species of Terminalia, are used by the natives of India in tanning and dyeing. They contain a considerable quantity of tannin, gallic acid, and gum; and are far less known than they deserve to be in this country. *Toondewa* and *Ukulbere*, two yellow dyes, the colours of which were not particularly fine or desirable. In concluding, Mr. Solly remarked, that the dyes called *Maddi*, *Poppli Chickha*, and also the *Maen*, being new, and seeming likely to be useful, were worthy of being submitted to manufacturers.—*Athenæum*, No. 648; *abridged*.

NEW SUBSTANCES FROM ALOES.

THE first of these Substances has been incidentally noticed at p. 66 of the present volume, as a new Acid for Dyeing. It results from the action of nitric acid upon Socotrine Aloes. M. Boutin, the discoverer, has presented to the Academy of Sciences, at Paris, a memoir upon this product, which he calls *polychromatic acid*, and considers to be of great importance in dyeing and calico-printing. By varying the mordants, it yields an infinite number of tints, all of them finer and more permanent than can be obtained by the usual processes. It has the appearance of a reddish-brown powder, is very slightly soluble in water, but still sufficiently so to colour a large quantity of it at common temperatures; it is more soluble in alcohol, and in dyeing possesses the double advantage of yielding, in small quantities, much more colour than the substances usually employed. This acid is susceptible of combining with metallic oxides, and of forming salts of different degrees of solubility, and all of different colours. Those which the author presented to the Academy were the salts of potash and silver.

The second new substance, also discovered by M. Boutin, is Cyanil, which is formed by the aid of nitric acid upon Aloes, or rather upon polychromatic acid. This product is liquid and colourless when it has been purified by distillation from chloride of calcium; and it has so great an analogy, on account of its poisonous properties, with hydrocyanic acid, that it is natural to conclude them to be isomeric bodies. It is so deleterious, that one or two drops in an eight-ounce bottle, half filled, are sufficient to impart to the air which occupies the remainder of the bottle the power of immediately killing a bird which is made to breathe it; a capillary tube, slightly impregnated with this liquid, and put into the eye of a bird, produces also the same sudden effect.—*L'Institut*, No. 313; *Philos. Mag.* No. 101. *Journal de Pharmacie; Philos. Mag.* No. 109.

MYRONIN—MYRONIC ACID.—ESSENTIAL OIL OF MUSTARD.

M. BUSSY has ascertained by experiment that there exist in the farina of mustard-seed two principles, the reaction of which, under the

influence of water, gives rise to an essential oil. One of these is a peculiar acid, which M. Bussy calls *Myronic Acid;* and the other is a substance which has great analogy with albumen, and which he calls *Myronin.*

The properties of these substances are as follows:

Myronic acid is inodorous, and exists in mustard combined with potash. Myronate of potash is a salt which is soluble in water, perfectly crystallizable, inodorous, colourless, of a bitter taste, and decomposable by heat. The myronic acid, which may be isolated, combines also with soda, barytes, ammonia, and yields salts, which, like the myronate of potash, develop essential oil under the influence of myronin.

Myronin is a substance soluble in water, coagulable, like albumen, by heat, alcohol, and acids; it has great analogy with emulsin, but neither albumen, emulsin, nor the synoptase of M. Robiquet, can replace it for the production of essential oil of mustard. When put into contact with a solution of myronate of potash, it develops the odour of mustard, and the liquor submitted to distillation yields essential oil. It exists in black mustard, together with myronate of potash; but yellow mustard, on the contrary, contains myronin, but no myronate of potash.

It appears that MM. Boutron and Fresny had simultaneously with M. Bussy discovered the above-described facts.—*L'Institut*, No. 313; *Philos. Mag.* No. 101.

ESSENTIAL OILS IN PLANTS.

In a paper read to the Royal Society of Edinburgh, on Feb. 3, "On the Influence of various circumstances in Vegetation in modifying the Physiological Actions of Plants," the author, Dr. Christison, entered into some details respecting narcotic plants, commencing with the family of *Amygdaleæ*, the leaves of several of which are eminently poisonous, in consequence of containing, or producing, when bruised, a hydrocyanated essential oil. He showed this oil most to abound in the leaves of the cherry-laurel, *(cerasus lauro-cerasus,)* when they are young and undeveloped; and that it goes on diminishing gradually in proportion to their weight, as they increase in age and vigour, until the commencement of their second season, when the old leaves, though plump and luxuriant, do not contain above an eighth or tenth of what they possessed in the infant state, or of what is contained in the young undeveloped leaves of the same period. This is a complete reversal of the generally-admitted law in respect to the formation of volatile oils in leaves.

The consideration of this fact led to some statements upon the mode and form in which some essential oils, and other active principles, exist in the leaves of plants; and the conclusion was drawn, that in all probability, many active principles, which are separated from plants by simple processes, do not exist ready-formed in the leaves; but, as in the familiar case of mustard seed and bitter almond, are only developed when the structure of leaves is broken up, and principles of a different

kind, secreted in distinct cells, are brought into contact with one another, or with water.—*Selected from Jameson's Journal*, No. 56.

DETECTION OF ALCOHOL IN ESSENTIAL OILS.

For the above purpose, M. Borsarelli employs a small cylindrical tube closed at one end; this is two-thirds filled with the oil, and there are dropped into it small pieces of chloride of calcium, which are quite dry, and free from powder; the tube is then closed, and heated in a water-bath to 212° for four or five minutes, taking care to agitate it occasionally, and to allow it to cool slowly.

If the essential oil contains a notable proportion of alcohol, the chloride dissolves entirely, and forms a liquid stratum, which occupies the lower part of the tube, while the essential collects in the upper. If the oil contains only a very small portion of alcohol, the fragments of chloride of calcium effloresce, lose their form, and unite at the bottom of the tube into a white adhesive mass: when it is quite pure, the pieces of chloride suffer no change, even in their form.

It is proper to observe, that in trying an essential oil it is right to employ a very small portion at first, and to add successive portions gradually; otherwise, if the proportion of alcohol be very small, it may be absorbed by the chloride without sensibly altering it, and even without showing its presence. It is easy when the operation is over to determine the proportions of a mixture of alcohol and essential oil, by comparing its weight or volume with that of the pure oil which floats upon the alcoholic solution of the chloride.

The same process, the author states, may be employed for determining the quantity of alcohol which æther contains; but the tube should be longer, and not too perfectly closed.—*Journ. de Pharm.*; *Philos. Mag.* No. 109.

DISTILLATION OF ROSE-WATER IN INDIA.

Ghazeepore has long been celebrated for its Rose-water; yet the native apparatus for distilling it is of the simplest construction. It consists of a large copper or iron boiler, well tinned, capable of holding from eight to twelve gallons, (shaped like the earthen hoondahs in which the Gomastahs send in their opium,) having a large body with a rather narrow neck, and a mouth about eight inches in diameter; on the top of this is fixed the head of a still, which is nothing more than an old *deckchee*, or cooking vessel, with a hole in the centre to receive the tube or worm.

The tube is composed of two pieces of bamboo, fastened at an acute angle, and it is covered the whole length with a strong binding of corded string, over which is a luting of earth, to prevent the vapour from escaping. The small end, about two feet long, is fixed into the hole in the centre of the head, where it is well luted with flour and water. The lower arm or end of the tube is carried down into a long-necked vessel or receiver, called a *bhubka*. This is placed in a handee of water, which, as it gets hot, is changed. The head of the still is

luted on to the body, and the long arm of the tube in the bhubka is also well provided with a cushion of cloth, so as to keep in all the vapour. The boiler is let into an earthen furnace, and the whole is ready for operation.—*Dr. Jackson, in Journ. of Asiatic Soc. of Bengal.*

ATTAR OF ROSES.

At Ghazeepore, to procure the Attar, the Roses are put into the still, and when the water has gradually come over, it is placed in a large metal basin, which is covered with wetted muslin, tied over to prevent insects or dust getting into it. This vessel is let into the ground about two feet, which has been previously wetted with water, and it is allowed to remain quiet during the whole night. The Attar is always made at the beginning of the season, when the nights are cool. In the morning, early, the little film of attar, which is formed upon the surface of the rose-water during the night, is removed by means of a feather, and it is then carefully placed in a small phial; and day after day, as the collection is made, it is placed for a short time in the sun, and after a sufficient quantity has been procured, it is poured off clear, and of the colour of amber, into small phials. Pure attar, when it has been removed only three or four days, has a pale greenish hue; by keeping it loses this, and, in a few weeks' time, it becomes of a pale yellow. The first day's distillation does not produce such fine attar as comes off afterwards, in consequence of the dust or little particles of dirt in the still and the tube being mixed with it. This is readily separated, from its sinking to the bottom of the attar, which it melts at a temperature of 84°. From one lac of roses, it is generally calculated that 180 grains, or one tolah, of attar can be procured; more than this can be obtained if the roses are full-sized, and the nights cold to allow of the congelation. The attar purchased in the bazar is generally adulterated, mixed with sandal oil or sweet oil. Not even the richest native will give the price at which the purest attar alone can be obtained; and the purest attar that is made is sold only to Europeans.—*Dr. Jackson; in Journal of the Asiatic Society of Bengal.*

BLEACHING VEGETABLE WAX.

Mr. E. Solly has stated to the British Association, that he has found the following method to answer the purpose most completely, the Wax being bleached in a few minutes, and a greater effect of discolouration produced than by the mere passage of chlorine for half an hour. This method consists of bleaching by pure nitric acid, by melting the wax, pouring in a small quantity of sulphuric acid, composed of one part of oil of vitriol to two of nitrate of soda, and then stirring in a few crystals of nitrate of soda, the whole to be agitated with a wooden stirrer, and kept heated. Nitric acid is then evolved in considerable quantity and purity from a large surface, and in such a manner that all the acid evolved must necessarily pass through the melted wax. This process is cheap and rapid, and the residuum being merely a little

solution of sulphate of soda, is very easily removed.—*Literary Gazette*, No. 1236.

ANIMALCULAR PROCESS OF PUTREFACTION.

DURING the Putrefaction of animal substances, their elements are in a state of incessant change, and in a condition of disturbed equilibrium, which is altered and modified by the feeblest of the forces operating on it by foreign materials, and foreign affinities and temperature. Such a condition appears to afford the most fruitful field for the developement of imperfect, and of the lowest class of, animals, and of microscopic animals, whose ova, as is well known, are every where distributed in the most inconceivable manner: they are developed in myriads in the putrefying substances; and they propagate themselves in myriads, for they appropriate to their nourishment the products of putrefaction. Many naturalists regard the chemical process of putrefaction as a mere consequence of the production of these animals; which is just as natural as it would be to ascribe the putrefaction of wood, and its decay, to the plants for whose nourishment the decomposing soil serves. But these animals are not produced in decomposing substances, when the condition of its presence, viz. contact with the atmospheric air, is cut off; just in the same way as mites do not appear in cheese when flies have no access to it. This opinion falls to pieces of itself when we consider, that, on the disappearance of the putrefying body, the animals die; that, after their death, there must be a cause present which produces the destruction of their organization, and which determines the conversion of the component parts of their muscles and organs into new solid and gaseous products. This cause is, therefore, ultimately a chemical process. — *(Prof. Liebig, in Poggendorff's Annalen;) Jameson's Journal*, No. 56.

NEW PRESERVATIVE.—THE GANNAL PROCESS.

THE following is M. Gannal's mixture for injecting the carotid artery, whereby all the purposes of embalming are attained:—One kilogramme of dry sulphate of alumine, dissolved in half a litre of warm water, and marking 32° of the aerometer. Three or four litres of this mixture will be sufficient to inject all the vessels of the body, and will preserve it in summer; in the winter, from one to two litres will be enough. But, to keep away insects, there should be added to the above chlorure of copper, at the rate of 100 grammes to a kilogramme of the sulphate of alumine, or else 50 grammes of arsenious acid. This applies to all kinds of animals, birds, fishes, &c., as well as to the human subject.—*Literary Gazette*, No. 1222.

To M. Gannal the Montyon prize was awarded, we are told; and, in consequence of the above powerful testimonials, the process has been introduced into the great anatomical schools in Paris. In nearly all the recent interments of distinguished individuals, the old and revolting mode of embalming has been superseded by this new and simple method. The Government of France, in cases of suspicious death,

where the preservation of the body is likely to lead to the furtherance of the ends of public justice, have resorted to the process; and with such success, that, in a recent instance of the murder of a youth at La Vilette, the body, by being exposed, in a state of perfect preservation, at the receptacle of La Morgue, at Paris, for more than two months, led to the discovery of the murderer.

Drs. B. G. Babington and G. O. Rees have made a series of experiments with this process, and the favourable results obtained by them will be found in the "Guy's Hospital Reports."—*Abridged from Mr. Smith's Circular, and Literary Gazette*, No. 1226.

POISONING BY ARSENIC.

A MEDICO-CHEMICAL investigation of the properties of Arsenic has excited considerable discussion during the past year. The question has long been one of considerable interest and importance, either therapeutically considered, or in connexion with legal medicine; which has been materially increased by the evidence given in the trial in France of Madame Laffarge, for poisoning her husband. With the general narrative of this case, (which is an extraordinary instance of the difficulties which beset forensic medicine,) we have nothing to do, further than to mention that it has stimulated the professors of medico-legal chemistry, and, doubtless, been productive of valuable results to science. All that can be here attempted is a *précis* of the most important of these investigations.

In the *Moniteur*, during November, appeared a summary of M. Orfila's Toxicological Experiments, whence is extracted the following; with a view to prove, on the one part, that Arsenic and Tartar Emetic, when absorbed, are mingled with the blood, pass successively through all the organs, and are rejected, more or less rapidly, as excrementitial products, through the urines; on the other, that the treatment by tonics is disastrous, while the treatment by diuretics is regarded as most advantageous by M. Orfila.

M. Orfila established—1, that the elimination of poison through the urine is much more rapid in the case of tartar emetic than of arsenic; 2, that this elimination takes place from the commencement of the poisoning, and is continued so long as the organs contain poison; 3, and lastly, that arsenic or antimony remains in the interior organs, the liver especially, even when no traces of it are longer to be found in the excrementitial liquid. His experiments all confirmed these results, whether they treated the urines of dogs, which had survived the poisoning, or operated upon the urine or the organs of those which were slain, or had died within one or six days after imbibing the poison. Moreover, at the request of several physicians, it was established that the urines of many sick persons who had taken either emetic or arsenic as medicaments, exhibited, when submitted to Marsh's apparatus, traces by no means equivocal of arsenic or of antimony.

The first care to be taken in a course of medico-legal experiments is to make certain of the purity of the reactions employed. For

Marsh's apparatus, M. Orfila observes, that the precautions to be taken are very simple. Zinc and water are put into a flagon. Some pure sulphuric acid is added, and the gas is inflamed. If the jet of this flame makes no deposit on a porcelain plate, all the reactions employed are pure, and Marsh's apparatus may be used with safety. We have no objection to make to this reasoning. But we must observe, that it is not every brilliant spot which is arsenical; and this is confessed by M. Orfila himself. There are employed for the treatment of arsenical matters, *potass à l'alcohol*, nitric acid, and nitrate of potash. We need scarcely add, that the utmost pains must be taken to secure the purity of these substances. M. Orfila ordered a kilogramme of nitrate of potash to be taken by chance from a druggist's, this nitrate being crystallized. 500 grammes of this nitrate of potash were decomposed, through exposure to heat, by 435 grammes of pure sulphuric acid, and yielded in Marsh's apparatus no trace of arsenic, while the second half of the same nitrate, with the addition of the hundredth part of a gramme of liquid arsenical acid, at once gave numerous metallic spots; whence the Professor thought himself justified in concluding, that the common nitrate of potash, used for purposes of trade, when it is crystallized never contains arsenic. But M. Orfila also demonstrated by divers experiments that the peroxyde of common iron, and that used by druggists, almost always contains arsenic. In seeking for the origin of this poisonous substance in a medicament usually accounted an antidote, M. Orfila showed that it was owing to the pyrites of iron employed for the preparation of colcothar, which pyrites is frequently known to contain arsenic.

As to the important question of the spots supplied by Marsh's apparatus, arsenical spots are brilliant, and of a clear grey, very like the colour of steel. Antimonial spots are deeper, more opaque, and have blue reflection, like the crystals of antimony. But if we suppose spots of arsenic and antimony mixed, will it be always easy to distinguish and appreciate them?

Arsenic contained naturally in the Human Body.—M. Orfila has also read a memoir on the above subject, before the Royal Academy of Medicine, at Paris: the experiments detailed were made with M. Couerbe, and their object was to solve the following questions:—

1. Does arsenic exist originally in the human body? 2. Do the viscera contain any? 3. Can its existence in the muscles be proved? 4. Is it possible to determine that the arsenic obtained from a corpse is not that which originally existed among the elements composing the tissues, but was introduced into the digestive organs, applied to the exterior, &c.?

I. Arsenic exists in human bones: if the bones of an adult be calcined, taking care not to raise the temperature too high, and to avoid contact with the fuel, these bones, when reduced to powder and treated with sulphuric acid, and next tried in Marsh's apparatus, will yield brown, brilliant, and thick arsenical spots. This result

was obtained both from the bones of corpses of adults who had been dead some days, and of those who had been buried for some months.

When the calcination is effected at a white heat, no arsenic is obtained, nor is any procured from the bones of commerce reduced to a soft paste; but if they be subjected to heat, and the processes indicated (nitric acid, potash, and sulphuric acid,) a certain quantity of arsenic is obtained.

From this first series of experiments, which amount to fourteen, I conclude, says M. Orfila,—1st, that the bones of the human adult, of the horse, ox, and sheep, contain minute portions of arsenic, which it is possible to discover by treating the bones with potash purified by alcohol and pure sulphuric acid.

2dly. This quantity of arsenic is not increased by long burial.

3dly. Vitrification removes a portion of it, which is undoubtedly occasioned by the volatilization.

4thly. Among the conditions favourable to the discovery of arsenic, must be especially reckoned that of not calcining the bones too strongly; and secondly, of carefully avoiding the contact of fuel.

5thly. When bones are treated with pure water and ebullition, no arsenic is discoverable.

6thly. If in operating in this mode, any arsenic be detected, it has certainly been, in some mode, introduced into the economy.

II. No arsenic is found in the viscera, unless it has been absorbed. The organs of a dog, which was hung, treated by the usual processes, did not yield any. The blood, brains, the liver, spleen, kidneys, intestines, stomach, &c., gave no traces of it. Carbonized with nitric acid, and afterwards tried in Marsh's apparatus, white opake spots only were obtained, and those were also produced without the presence of these organic matters.

The liver of an adult gave none; nor did the decoctions made with the various organs yield any.

From these facts we may infer, (observes M. Orfila,) but not positively, that the viscera do not originally contain arsenic; or to state the fact more accurately, and not to prejudice the case, it may be asserted that they do not yield any when treated with boiling water, sulphuretted hydrogen, or when carbonized by concentrated nitric acid, &c. It may so happen that the quantity is too small to be detected by sulphuretted hydrogen, or that it is lost by carbonization; but by acting on a large quantity of brain or other organs, it may be detected. At any rate, it is sufficient, at present, to have ascertained, that the viscera yield no arsenic by the reactions described, unless it has been introduced by poisoning.

III. It is not proved that muscular flesh contains arsenic: twelve pounds of it, taken from the corpse of an adult, carbonized by nitric acid, and tested by Marsh's apparatus, gave white opake spots; some were brilliant, with a blueish tint; others were yellow, and had an arsenical appearance; dissolved in boiling nitric acid, they gave no alliaceous smell when put on red-hot charcoal; in fact, they possessed none of the characteristics of arsenic. These spots were, however,

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very numerous; submitted for nearly twenty days to a current of sulphuretted hydrogen gas, they gave no indication of arsenic. It is possible that they were a mixture of arsenic and animal matter, and that the muscular flesh of two or three bodies might yield some by analysis; lastly, other processes may discover in it the same quantities as those employed, by occasioning less loss; therefore, adds M. Orfila, I will not conclude positively, that arsenic does not exist in muscular flesh.

IV. It is possible to ascertain whether the arsenic which may be discovered does not come from the organic substance itself, but that it has been combined with it by absorption. For if it be found in the bones, it will not be removed by long boiling in water, unless it had been introduced; and the same holds good with respect to the blood and the organs which have been examined.

Lastly, if the muscles yield spots, some of which resemble arsenic at first sight, the distinctive characters which have been stated must be remembered; and if the subject had taken arsenical remedies, this circumstance ought to be particularly attended to. — *Journ. de Chim. Med.; Philos. Mag.*, No. 103*.

DETECTION OF ARSENIC.

SEVEN cases reported in the *Medicinische Annalen*, of a family poisoned by eating soup, prove, beyond further dispute, the superior efficacy of the hydrated peroxide of iron as an antidote to Arsenic. On analysing the portion of the soup left, it was found to contain a quantity of white oxide of arsenic. The matter ejected from the stomach was also analysed, and showed the presence of arsenic; in the portions mixed with the peroxide of iron, (taken as the antidote,) it was ascertained that the peroxide was changed into the arseniate of iron; thus establishing its claims as a specific. Two other cases are detailed, in which two children, one eight years and the other ten years old, had swallowed half a spoonful of arsenic mixed by mistake in some vegetables; they were instantly seized with symptoms similar to the above. The peroxide of iron was administered six hours after the accident, and was attended with complete success.

A chemical analysis being ordered to take place in consequence of a

* The *Gazette des Hopitaux* contains a very important letter from M. Couerbe, of Verteuil, in the Gironde, in which he states that the discovery of arsenic in all human bodies was originally made by him, and not by M. Orfila; and that the latter has acknowledged it. He also shews that a considerable quantity of arseniate of calcium exists in the bones: and, also, that the more a body becomes putrid, the more easily is the arsenic extracted from the fleshy and muscular parts of a body. He was one of the physicians who declared that M. Laffarge was not poisoned; and he now adduces the startling fact, which M. Orfila has admitted since the conclusion of the trial, that the peroxide of iron given to M. Laffarge as an antidote to the arsenic he was supposed to have taken, did itself contain arsenic at the time of its being purchased; and that all peroxide does so, more or less. He shows that M. Orfila's conclusions as to the arsenic found in M. Laffarge's body having been given him, are perfectly erroneous, the arsenic being no more than what is in every body naturally. M. Orfila has himself partially admitted the truth of these statements.—*Literary Gazette*, No. 1241.

suspected poisoning at Ambares, near Bourdeaux, in France, the process was confided to three eminent medical men of the neighbourhood, who produced the most decided results. By the aid of Marsh's Apparatus,* they withdrew from the stomach of the deceased, and the parts adjoining, a quantity of Arsenic in a metallic state, with which the operators were enabled to write "Arsenic" in bold characters, upon a large porcelain plate. Guided by the system adopted by M. Orfila, they next carried their researches to the liver and heart of the deceased. The absorption was found to be general throughout the body, and every organ inspected furnished them with spots, which were evidently arsenical, and which were fixed upon porcelain saucers as evidence for the trial. "Marsh's Apparatus," observes the *Indicateur de Bordeaux*, "so fine, so delicate, so celebrated on various accounts, becomes, in the hands of scientific and conscientious men, the most precious means of investigation, and the sole means which will hereafter be employed in those toxicological researches of which the object is to detect the presence of arsenic."

MODIFICATION OF MARSH'S APPARATUS.

M. LASSAIGNE, on Oct. 12, read to the Academy of Sciences, at Paris, the following method of operating with Marsh's Apparatus, as being equally sure, and requiring less skill and dexterity on the part of the experimenter. The gas, disengaged by Marsh's Apparatus, is made to pass into a solution of pure nitrate of silver, when the arseniated hydrogen gas, mixed with the pure hydrogen gas, is decomposed by little and little by the oxide of the silver. The latter is then reduced, the liquor becomes brownish, and the metallic silver is deposited in black flakes; whilst there is a production of arsenic acid, which remains in solution, and is mixed with the excess of the nitrate of silver employed. All the arseniated hydrogen gas having been absorbed and decomposed, some chlorhydric acid is added to the solution, little by little, in order to decompose the excess of the nitrate of silver, and transform it into a chlorure. A filtration is then made, in order to separate the chlorure, which is mixed with the metallic silver, and which is precipitated by the passage of the arseniated hydrogen. An evaporation is afterwards made, at a gentle heat, in a porcelain saucer. During the concentration and evaporation, the nitric acid contained in the liquor reacts on the arsenious acid, and makes it pass into the state of regular arsenical acid. This latter substance forms the residuum of the operation, and its chemical properties may be readily tested. By this method, one milligramme of arsenious acid, dissolved in 1000 grammes of distilled water, or one quart, had been detected.—*Literary Gazette*, No. 1240.

POISONING BY TARTAR EMETIC.

M. ORFILA has submitted to the Academy of Medicine, at Paris,

* See Year-book of Facts, 1840; pp. 171-172: and Arcana of Science, 1837, p. 157-163; for descriptions of this Apparatus.

his experiments on Poisoning by Tartar Emetic. After death by this poison, he has detected traces of the deleterious substance in the various organs, the blood, &c. of the body. To perform the experiments, he introduced from 36 to 110 grains of the Emetic into the cellular tissue of a dog; and at another time, from 15 to 25 grains into the stomach of an animal of the same kind, after having had the œsophagus tied up to prevent the action of vomiting: in these cases, the animal uniformly died between two and four hours after taking the emetic, according to the dose and the age and strength of the dog. In one case, the animal died, although only a few grains of this substance had been rubbed on its thigh uncovered of its hair. At the expiration of a few hours, the blood retained no trace of the poison, and at a later period no vestige of it could be found in the body. — *Literary Gazette*, No. 1210.

PRECAUTIONS AGAINST POISONING.

On July 21, M. A. Chevalier communicated to the Academy of Medicine, at Paris, the substance of a Report which M. Grimaud, chemist of Poitiers, had been commissioned to draw up by the Minister of Public Instruction on the advisability of colouring poisonous matters sold in commerce, and imparting to them some strong taste, in the cases of their being without these qualities, in order to hinder accidental poisonings of human beings. The Report stated, that arsenic was the most colourless and insipid of poisons commonly sold in commerce, and occasioned the greatest number of poisonings: thus, out of 212 cases selected in France, 132 had been effected by arsenic; and out of 462 in England, 181 cases. The total quantity of arsenic annually imported into France, is 121,743 kilogrammes; and the Report strongly recommended that the minister should be requested to name a committee to examine into the best way of colouring this large quantity of poison. Out of 221 persons who had taken arsenic within one year, 100 had died. the rest having been recovered by various antidotes.—*Literary Gazette*, No. 29.

THE DAGUERREOTYPE.—PHOTOGRAPHY.

The contributions to this new process, now considered to be almost exclusively *chemical*, have been very numerous during the past year; so that we shall only be enabled to direct attention to the more important communications, by brief abstract or simple enumeration of the heads of details.

On Jan. 6, M. Arago read to the Academy of Sciences, at Paris, a letter from M. Blanqui, of Toulouse, communicating a plate, with a photographic impression, obtained by a modification of M. Daguerre's apparatus, in which the *red* brick of a house was represented in the natural colour by the action of the light; but the *green* shutters of the same house were also represented in *red*.—*Literary Gazette*, No. 1200.

On Feb. 17, M. Biot presented to the Academy of Sciences, at Paris, several Photographic images obtained by the passing of the Drummond Light through various lenses, and ultimately through a

transparent painting. The representation of this painting was obtained in black and white on the indiced surface of the metallic plate with great distinctness.—*Literary Gazette*, No. 1206.

On Jan. 15, a valuable paper was read before the Society of Arts for Scotland, on Daguerréotype, by Dr. Andrew Fyfe; in which the author conveys an accurate knowledge of the *rationale* of every stage of the process, and considers his results as not only tending to illustrate the action that occurs, but also leading to some important practical applications in the arts. This paper will be found entire in *Jameson's Journal*, No. 56.

On March 5, the reading of a paper was resumed and was concluded before the Royal Society, "On the Chemical Action of the Rays of the Solar Spectrum on Preparations of Silver and other Substances, both metallic and non-metallic; and on some Photographic Processes:" by Sir John F. W. Herschel, Bart. The following are some of the points of novelty which occur in this paper:—

1. Detection of luminous rays, and a new prismatic colour beyond the extreme violet.
2. Discovery of a chemical spectrum *beyond the extreme red rays*.
3. Assumption, according to circumstances, of either an oxidizing or a de-oxidizing action by the chemical rays at either end of the spectrum.
4. Formation of photographic impressions of the spectrum, exhibiting the prismatic colours in imitation of the colours of those rays by which they are produced, and a variety of other tints.
5. Photographic effects produced by the simultaneous action of two rays differing in refrangibility, which neither of them, acting alone, is capable of producing at all.
6. Action of the spectrum on vegetable colours.
7. Discovery of a process of secret photographic painting, in which the image may be preserved *ad infinitum* in an invisible state, capable of being at any moment rendered visible.
8. Account of a process for fixing photographic pictures on glass plates.
9. Analysis of the absorbent action of various media on the chemical rays.
10. Account of a self-registering photometer for meteorological purposes.

Of this valuable paper, (for which the Author has received one of the Royal Society's Medals), an Abstract will be found in the *Philosophical Magazine*, No. 103.

On April 30, Prof. Dr. Berres read to the Imperial Society of Vienna, an important communication relative to the discovery of a method of fixing and engraving Daguerréotype pictures, and printing from them as with ordinary copper plates. For an abstract of this paper, see *Athenæum*, No. 656. In No. 663 of the same Journal, is the acknowledgment of the receipt of two impressions from plates thus engraved. "These impressions," says the Editor, "are shadowy and very indistinct, but the design is sufficiently made out to justify the hope that further experiments will render the discovery practically available." Dr. Berres's proportions are as follows: "Seven parts of acidum

nitricum, of 40 degrees of strength, to eight parts of distilled water. With gum arabic, the operation is somewhat longer in being finished, but the picture is much handsomer; without gum it is quicker, but it requires much more care and attention to produce a good engraving. When the nitric acid produces a precipitate upon the silver plate, pour upon it ammonia, and the precipitate will instantly disappear. From time to time, take the plate out of the acid, and wave it about; thus drying it, you perceive better the progress of the engraving. When the acid becomes muddy, it is necessary to change it."

M. Raifé recommends as an economical substitute for silver plates the employment of silver paper, which, (the designs being fixed by means of a solution of hypo-sulphite of soda,) may be kept between the leaves of a portfolio. He advises that the paper be pasted on a frame, when it is dry, with whiting; which is to be rubbed in with a piece of calico.—*Athenæum*, No. 671.

In the *Philosophical Magazine*, No. 101, will be found "An Account of some Experiments made in the South of Virginia, on the Light of the Sun. By John Wm. Draper, M.D., Prof. Chemistry, University, New York." The same Number likewise contains a paper "On the Permeability of Various Bodies to the Chemical Rays. By Robert Hunt," of Devonport. In No. 103, *Philos. Mag.*, will be found a very interesting series of "Experiments and Observations on Light which has permeated coloured Media, and on the Chemical Action of the Solar Spectrum:" also, by Robert Hunt. Another paper, by the same author, "On the use of Hydriodic Salts as Photographic Agents," appears in Nos. 109 & 110, *Philos. Mag.*: No. 109 also contains a paper by Prof. D. Draper, "On the Process of Daguerréotype, and its application to taking Portraits from the Life."

Prof. Draper states there to be no difficulty in procuring impressions with the moon by the Daguerréotype, beyond that which arises from her motion. By the aid of a lens and a heliostadt, the Professor caused the moonbeams to converge on a plate, the lens being three inches in diameter. In half an hour, a very strong impression was obtained. With another arrangement of lenses, he obtained a stain nearly an inch in diameter, and of the general figure of the moon, in which the places of the dark spots might be indistinctly traced. An iodized plate, being exposed for fifteen seconds only, close to the flame of a gas-light, was very distinctly stained; in one minute there was a very strong impression. On receiving the image of a gas-light, which was eight feet distant, in the camera, for half an hour, a good representation was obtained. The flame of a gas-lamp was arranged within a magic lanthorn, and a portion of the image of a grotesque on one of the slides received on a plate; when a very good representation was procured. With Drummond's Light, and the rays from a lime-pea in the oxyhydrogen blowpipe, the same results were obtained.*

* Mr. Ibbetson has exhibited to the British Association, a number of drawings of fossils by the Daguerréotype process, in which he had made use of the oxyhydrogen microscope, which had magnified the object in a manner highly advantageous for examination.

As a specimen of the accuracy of Portraits taken by Prof. Draper, he states "the eye appears beautifully; the iris with sharpness, and the white dot of light upon it, with such strength and so much of reality and life, as to surprise those who have never before seen it. Many are persuaded, that the pencil of the painter has been secretly employed to give this finishing touch."

We have likewise seen a miniature which had been successfully executed upon a principle similar to that of the Daguerréotype process, by Mr. A. J. Wolcott, of New York; who states that he has "discovered the means of taking likenesses from life by aid of a concave reflector, so placed as to receive the rays from the person whose likeness is to be taken, and convey them to a focus on a prepared plate, placed between the person and the reflector." The plate is prepared according to the process of M. Daguerre, who employs the camera for producing the image; except that Mr. Wolcott substitutes reflectors, and thus reduces the length of the sitting to five minutes' duration. Mr. W. has patented his process in America and Great Britain.

In the Proceedings of the British Association, Dr. Schäfheutl reports two methods of producing Photogenic Drawings: one similar to Mr. Talbot's mode, which he terms the negative; and the other with the prepared paper on metallic plates, the positive.

The improvements in the New Art in progress in France are important. M. Hubert, architect, has presented to the Academy of Sciences, at Paris, plates prepared according to the method of M. Fizeau, with chloride of gold, in order to give more tone to the drawing; which process he is also applying to old plates. In December, he had succeeded in colouring these plates, and had already obtained white, blue, and yellow, by a process which he had not then communicated. M. Jobard has sent to the Academy a sealed packet, in which he describes a method of converting Daguerréotype drawings into lithographs.

One of the workmen of M. Lerebours, the Parisian optician, has made with the Daguerréotype, some photographic representations of the principal buildings of Rome; thus proving how little the apparatus in question stands in need of being invariably placed in the hands of a man of science.

M. Grehoff, of Moscow, has stated to the French Academy, that he has succeeded in rendering Daguerreotype drawings ineffaceable, and has sent plates possessing this property. He has succeeded in obtaining drawings on copper and brass plates, and announced, in December, that he could transport an engraved plate on copper, and engrave it afterwards, whether in relief or intaglio.

At a meeting of the Asiatic Society, Oct. 2, Dr. O'Shaughnessy gave some details, accompanied by specimens, of a new kind of Photographic Drawing, by means of the sun's light, of which the principle wholly differs from that in Europe; where nitrate of silver is the colouring agent. Prof. O'Shaughnessy uses a solution of gold, and produces many various tints, from a light rose colour, through purple, down to a deep black; and what is more extraordinary, a green! He

also uses a lens, which expedites the process, and gives different shades.—*Asiatic Journal.*

A more directly useful application of the Art remains to be noticed, viz. to Engineering, in enabling copies of drawings, or views of buildings, works, or even of machinery when not in motion, to be taken with perfect accuracy in a very short space of time, and with comparatively small expense. This system of copying not only the outline, but the tints of light and shade, united with accurate linear perspective, Mr. A. Gordon contends may be easily adapted to the purposes of the engineer, as well as to all those professions in which the art of drawing is used. Mr. Gordon divides the subject into two branches: 1. Copying drawings and plans by the transmission and absorption of light by prepared paper. 2. The fixing and preserving on the surface of a polished silvered plate the images collected in the focal plane of a camera obscura. The details of these processes will be found in the Report of the Proceedings of the Institution of Civil Engineers, *(Civil Engin. and Arch. Journal*, No. 38), to which Mr. Gordon adds M. Arago's remark, that "Photographic delineations having been subjected, during their formation, to the rules of geometry, we may be enabled, by the aid of a few simple data, to ascertain the exact dimensions of the most elevated parts of the most inaccessible edifices."

Mr. Cooper, jun., in illustrating Mr. Gordon's communication, stated the shortest time in which he had obtained a photographic picture in England to be 11 minutes; while, during a gloomy day in November, it took an hour and a half to procure a moderately good one.

DEXTRINE VARNISH.

Baron de Silvestre has made Varnish of Dextrine or Starch for pictures newly painted in oil, water-colour drawings, coloured lithographs, and for the permanent fixation of pencil drawings. He has also obtained from dextrine a glue, which supersedes all other gluey substances, and particularly mouth glue. In these different applications, dextrine is mixed with water in different proportions; two parts to six of water for varnish, and in equal parts for glue. He has always added one part of alcohol in the composition of the varnish, and half a part in that of the glue. The mixture should be filtered before being used for varnishing; and in the latter case, a fine wet muslin should be spread over the drawing, before covering it with the mixture of filtered dextrine. The description of these processes, and of the results obtained, is given in the *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, for the 2d of August, 1837. The Baron recommends the experimental application of this varnish to the fixation of photographic images.

Natural History.

ZOOLOGY.

RESEARCHES IN EMBRYOLOGY.

Dr. Martin Barry has presented to the Royal Society the *Third Series** of his Researches; consisting of Additional Observations. The author having in the paper to which the present is supplementary, made known the fact that the germinal spot in the mammiferous ovum resolves itself into cells, with which the germinal vesicle becomes filled, he has since directed his attention to the corresponding parts in the ova of birds, batrachian reptiles, and osseous fishes, which he finds to be the seat of precisely the same changes. The numerous spots in the germinal vesicle of batrachian reptiles and osseous fishes, are no other than the nuclei of cells. The cells themselves, from their transparency, are at first not easily discerned, and appear to have hitherto escaped notice; but after the observer has become aware of their presence, they are, in many instances, seen to be arrayed in the same manner, and to present the same interior themselves, as the corresponding cells in the ovum of mammalia.

In the representations given by Prof. Rudolph Wagner, the discoverer of the germinal spot, the author recognizes evidence of the same changes in ova throughout the animal kingdom. He confirms and explains the observations of R. Wagner, that in the ova of certain animals an originally single spot divides into many, and that in the ova of other animals the number of spots increases as the ovum ripens. But he expresses also an opinion that in all ova there is originally but a single spot, this being the nucleus of the germinal vesicle or cell.

The analogy between the ova of mammalia and the animal above mentioned, extends also to the substance surrounding the germinal vesicle, which consists of nucleated cells. — *Philosophical Magazine*, No. 111.

ELEMENTS OF THE BLOOD.

On July 27, M. Andral read to the Academy of Sciences, at Paris, in his own name, and in that of M. Gavarret, an interesting memoir on the variations of the Elements of the Blood in connexion with various maladies of the human body. The results were founded on the examinations of 200 patients and 360 extractions of blood, and the method of testing the blood was the same as that of MM. Prévost and Dumas. They had found, that out of 1000 parts of blood, the

* A notice of the *First Series* will be found in the Year-Book of Facts, 1839, p. 158; and of the *Second Series*, in the Year-Book, 1840, p. 177.

proportion of fibrine varied from 1 to 10; of globules, from 185 to 21; of the solid matter of the serum, from 104 to 57; and of water, from 915 to 725. It was rare that in all maladies the proportions should increase or diminish simultaneously; on the contrary, they generally varied in an inverse ratio. It resulted from this, that maladies might be divided into four classes, according as there was a tendency shown in the patient's blood to have any one of these four elements of blood unduly augmented. Several instances were given of this, as well as of the complication of phenomena, resulting from compound maladies. In acute articular rheumatism, it was ascertained that the mean quantity of fibrine varied from 7 to 8; its minimum varied from 4 to 5; its maximum was 10. In pneumonia, the same results as in rheumatism were observed. In acute capillary bronchitis, the mean quantity of fibrine was less than in the two former maladies, varying from 6 to 7; and its maximum being under 9. In acute pleurisy, the mean quantity of fibrine varied from 5 to 6; and the maximum did not exceed 6. In no cases did fibrine descend lower than 4, and rarely lower than 5. In all phlegmatic maladies the proportions of the globules became much diminished, but the solid matter of the serum varied scarcely at all. The water varied from 771 to 840 out of the 1000 parts. In all periods of phthisis there was a constant tendency to increase of fibrine and diminution of the globules; the former getting up to 6 in the worst stages of the disorder, but then suddenly diminishing as the patient sunk; the highest point being when a continuous fibrine motion was established. The globules diminished from 100 to 81 in the worst stages, but never fell below the latter number. The solid materials of the serum varied in phthisical complaints from 64 to 98;—the former cipher in one peculiar case being accompanied by the extremely low proportion of 2 for fibrine. Water, on the contrary, increased in phthisical patients' blood, and varied from 784 to 845.—*Literary Gazette*, No. 1229.

M. Magendie mentioned to the Academy that he had been occupied in similar researches, and would communicate them to the members.

PECULIAR BLOOD CORPUSCLES OF MAMMALIA.

Mr. George Gulliver, F.R.S., has continued his elaborate investigation of the Blood Corpuscles of the Mammalia, noticed in our previous volumes*.

In a paper read before the Royal Society, Feb. 6, Mr. Gulliver observes: "The blood corpuscles hitherto described in the vertebrate animals, have either a circular or elliptical form. Till the late discovery of M. Mandl, of the latter shape in the particles of the Dromedary and Alpaca, and the author's more recent observation of the same form in the Vicugna and Guanaco, the blood discs were supposed to be circular in all the mammalia, and the oval corpuscles to be confined to the lower divisions of the vertebrate animals.

Mr. Gulliver then proceeds to describe some peculiar forms of the blood corpuscle, which he believes have not hitherto been observed in

* See Year-Book of Facts, 1839, p. 138; and Year-Book, 1840, p. 185.

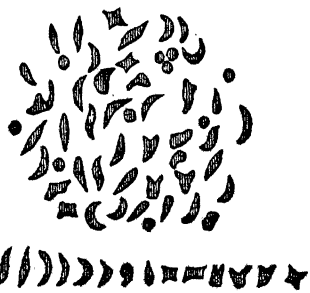
any class of animals. These corpuscles he has examined particularly in the Muntajac, Porcine, and Mexican Deer; and has observed in their blood a large quantity of crescentic or lunated particles, besides a few of the common circular figure. The former are very distinctly shaped; they are acutely pointed at the end, gibbous in the middle, with a convex and concave margin; or, being without a concavity, they merely present the figure of the segment of a circle.

But there are other forms equally singular: frequently, they are not curved, but straight, and gibbous at the sides—lanceolate, to use a botanical term; occasionally they are obtuse at one end, something like a comma in shape; or, from an acute projection of the convex part, approaching to a triangular figure. Some of them are also nearly square, and not uncommonly with elongation of the angles and concavity of the margins, the latter peculiarities being also sometimes observable in the triangular particles. Finally, they may present a sigmoid figure, as if from twisting of the ends of the lanceolate forms.

Like the common blood discs, these peculiar corpuscles are easily deprived of their colouring matter and rendered invisible by water: but if only a very small quantity of this fluid be added to them, they quickly swell out and assume an oval or circular figure, forming, by the approximation of their edges, long bead-like strings.

If these singular corpuscles are merely the result of changes of form in the circular discs, such transformations would appear to be altogether peculiar, and at variance with all our previous knowledge of the blood corpuscles of the mammalia.

The first impression will probably be, that some of the forms above described, are those which may be presented by different views of the circular discs, as they revolve on their axes. Hence, it may be necessary to observe, that the crescentic corpuscles are sometimes seen to turn over in the field of vision, and that the lanceolate particles often so revolve. Besides, their length much exceeds the diameter of the circular discs; the extremities of the oblong corpuscles are acutely pointed, and their form and appearance is altogether remarkably distinct and peculiar.



For the accompanying representation, Mr. Gulliver is indebted to his friend, Mr. John Dalrymple, who executed it from two portions of blood taken from animals alive, in the collection of the Zoological Society; one portion being dried on glass, and the other preserved in a weak solution of common salt. The larger group represents the corpuscles as he saw them with a deep achromatic-object glass, adapted to a

compound microscope. The smaller group exhibits the more remarkable forms of the corpuscles selected and compared together.—*Selected and abridged from the Philosophical Magazine*, No. 111.

On June 4, Dr. Martin Barry also read to the Royal Society a paper "On the Corpuscles of the Blood." The author having in his Researches on Embryology, Third Series, (see page 181 of the present work,) observed that some of the corpuscles of the blood undergo progressive alteration in their structure, believes them to be of the same kind as those described by Prof. Owen, and with him, considers the blood disc to undergo spontaneous subdivisions. Dr. Barry further observes that the corpuscles of the blood, in certain altered states, undergo rapid and incessant changes of form, which can be traced to the action of neighbouring cilia.

Should these facts be thought to confirm the opinion of John Hunter, that the blood "has life within itself," or "acquires it in the act of forming organic bodies," because its corpuscles in certain states exhibit "vital actions;" still his assertion that "the red globules" are the least important part of the blood, will appear to have no just foundation.

According to the author's views, the formation and nourishment of organs is not effected merely by the fluid portion of the blood, for he has discovered that the cells which he showed in this *Third Series* of *Researches in Embryology* form the chorion, are altered blood corpuscles; and he has further found that muscular fibres, (that is, the future muscle-cylinder, not the fibril,) is formed by the coalescence of cells, which also are derived from corpuscles of the blood.

The author thinks it not probable that muscular fibre and the chorion are the only tissues formed by the corpuscles of the blood: he is rather disposed to inquire, how many are the tissues which they do not form? Nerves, for instance, arise very much in the same manner as muscle-cylinders; and epithelium-cells sometimes suggest the idea of their being altered corpuscles of the blood.—*Abridged from the Philosophical Magazine*, No. 110.

THE HUMAN RACE.

The British Association have printed a set of "Queries respecting the Human Race," to whith they invite the attention of travellers and others. These questions, filling 13 closely printed octavo pages, refer specially to the stature and weight of the people—any prevailing proportion between different parts of the body—the complexion—the colour and character of the hair and eyes—the formation of the head and face—the skull—and all physical peculiarities; the effect of intermarriage where it prevails—health, longevity, physical and intellectual character—language—ceremonies—superstition—education—dress—treatment of sick—nature of sickness—inferior animals associated with man—ceremonies connected with marriages, births, and burials—notions of a future state—habitations of the people—monuments—remains of skeletons—tools and instruments—form of government—food—mode of cooking—clans or castes—laws—geo-

graphical limits and character of the region—population—religious observances.

THE ABORIGINAL AMERICANS.

Dr. Morton, in an elaborate work on the Skulls of various Aboriginal Nations of North and South America, (reviewed at considerable length, in *Silliman's Journal*, No. 78,) is of opinion that the facts which he has adduced tend to sustain the following propositions:—

"1. That the American race differs essentially from all others, not excepting the Mongolians; nor do the feeble analogies of language, and the more obvious ones, in civil and religious institutions and the arts, denote any thing beyond casual or colonial communication with the Asiatic nations: and even those analogies may, perhaps, be accounted for, as Humboldt has suggested, in the mere coincidence arising from similar wants and impulses in nations inhabiting similar latitudes.

"2. That the American nations, excepting the polar tribes, are of one race and one species, but two great families, which resemble each other in physical, but differ in intellectual, character.

"3. That the organical remains discovered in the mounds from Peru to Wisconsin, belong to the same race, and, probably, to the Toltecan family."

This important paper, illustrated with outlines and comparative tables of crania, has been transferred to *Jameson's Journal*, No. 57.

THE HUMAN VOICE.

On Feb. 11, Dr. Truman, in a lecture before the Society of Arts, described the anatomy of the Vocal Organs, and showed that in man, as in certain other animals, the breaking or shifting of tone is prevented by a simple apparatus, precisely similar to that in the mouthpiece of a clarionet. When this apparatus is defective, the voice runs into a falsetto. This was eminently the case with John Kemble, who never succeeded in overcoming the defect. On a *post-mortem* examination, it was found that it would have been impossible for him to avoid, in what may be called his hypertragical tones, that shrillness of sound which characterized him. What musicians call compass, is attributable to the extent to which different persons are enabled to elongate or shorten the windpipe by muscular action. Tone depends on the length of the column of air in the larynx, and in the length of its vibratory chords. The organs of voice in birds, for example, in their convolutions, produce the same effect as the winding of the French horn.—*Literary Gazette*, No. 1204.

ANATOMY OF THE BRAIN.

Dr. Foville, of Paris, who has been for upwards of twelve years past engaged in making new discoveries, and confirming his old ones, respecting the anatomical structure of the Brain, has thrown the substance of his researches into an elaborate paper, which has been

communicated by his friend, Dr. Hodgkin, to the *Philosophical Magazine*, No. 107. These highly interesting discoveries extend through 18 pages, the conclusion of which is as follows :—

"To sum up, (says Dr. Foville,) I consider that the fibrous parts of the Brain are conductors; some from without to within, others from within to without. I believe that these conducting parts may be distinguished into afferantes and efferentes, and that the distinct course of both the one and the other may be demonstrated. The first are inserted especially into the circumference of the grey substance, and the second into its internal surface.

"The grey substance of the convolutions intermediate between the two preceding orders of fibrous parts, seems to me to be the material substratum, through the instrumentality of which the will directs the movements of the body.

"The prominences constantly seen coupled in pairs on the arch of the skull, appear to me to be produced by the projection of the corresponding regions of the ventricles. The median eminences, not universally present, appear to be produced by the thickening of the bones.

"The median bone of the cranial arch is naturally divided into four sections; one, anterior, corresponding to the fore part of the corpus callosum, and to the convolutions developed before and beneath the level of the same part of that body.

"The second, more extensive, intermediate between the frontal and the parietal eminences, is of a length proportioned to the extent from before to behind of the corpus callosum. It ceases behind on a level with the posterior margin of that body.

"The third section often commencing from above to below, sometimes even hollowed into a furrow on the median line, is proportionate in length to that of that part of the hemispheres completely separated, behind the corpus callosum.

"The fourth section, intermediate between the superior occipital protuberances and the upper curved line of the os occipitis, displays in its middle a projecting quadrangle, corresponding to the hinder extremities of the ventricles, and to the convolutions situated behind and beneath these extremities."

An able report on the subject of Dr. Foville's Researches has recently been presented to the Academy of Sciences, at Paris, by Professor Blainville. It contains further discoveries made by the Doctor with regard to the origin of the eighth pair of nerves.—*Note: Ed. Philos. Mag.*

THE SPINAL NERVES.

On Jan. 6, was read to the Royal Society of Edinburgh, a paper "On the Functions of the Roots of the Spinal Nerves in corroboration of former Observations, proving that the anterior roots are nerves of motion, and the posterior, nerves of sensation;" by Sir Charles Bell, K.H. The instance produced was a case, in which the anterior roots of the nerves arising from the *cauda equina* were engaged in a

tumour, and the consequence during life, was the loss of muscular power, sensibility remaining unaffected.—*Jameson's Journal*, No. 56.

THE PULSE.

At a late meeting of the Royal Academy of Sciences and Belles-Lettres, at Brussels, M. Rameaux submitted the results of his inquiries as to the mean number of pulsations in man. These, it is stated, establish so positive a relation between the number of the pulsations and stature of the individual, that, by using the Tables of Growth, which M. Quetelet has given in his *Physique Sociale*, for the two sexes, the corresponding number of pulsations may be deduced; and the numbers so calculated agree, in the most satisfactory manner, with the numbers obtained by observation.—*Athenæum*, No. 655.

STRUCTURE OF BONE.

On Jan. 23, was read to the Royal Society, a paper "On the Structure of Normal and Adventitious Bone," by Alfred Smee, Esq. On examining, by means of a microscope, very thin sections of bone, prepared in a peculiar manner, the author observed a number of irregularly shaped oblong corpuscles, arranged in circular layers round the canals of Havers, and also rows of similar bodies distributed around both the external and the internal margins of the bone. Each corpuscle is connected by numerous filaments, passing in all directions, with the Haversian canals and the margins of the bone, and also with the adjacent corpuscles. He finds that the canals of Havers are vascular tubes, containing blood. The corpuscles themselves are hollow, and their cavities occasionally communicate with those of the canals; their length is equal to about two or three diameters of the globules of the blood. They exist in cartilaginous as well as osseous structures; and are found in every instance of adventitious bone, such as callus after fracture, morbid osseous growths, either from bone or from other tissues; and the author has also ascertained their presence in the bony and cartilaginous structures of inferior animals, such as birds and fishes. Measurements relating to these corpuscles, by Mr. Bowerbank, are subjoined; from which it appears that their diameters vary from about the 10,000th to the 4,000th, and their lengths from the 2,300th to the 1,400th, part of an inch.—*Athenæum*, No. 641.

TINGING OF BONES.

M. Flourens, in some experiments on the Tinging of the Bones of animals by infusing madder into their alimentary substances, has been led to the discovery that bones increase by the deposition of the bony matter outside, and that they diminish by the dissolution of bony matter in the medullary cavity. He exhibited the skeletons of some sucking pigs, as instances of the rapid action of madder in tinging bones; a fine rose colour having been imparted to the bones

within twenty-four hours after it had entered the stomach.—*Literary Gazette*, No. 1206.

CURE FOR SQUINTING, (STRABISMUS).

A CURE for Squinting, by the division of one of the straight muscles of the eye, has been recently introduced and most successfully practised. It was proposed by Dr. Stromeyer, of Hanover, but was first carried into effect by Dr. Dieffenbach, of Berlin, in January, 1840. It was brought to England in April, but has since been so much improved upon with finer instruments, that it is readily performed in two minutes with safety and precision. With a small curved knife it can be accomplished in a few seconds. Mr. C. W. G. Guthrie, jun., in a Report to the Royal Westminster Ophthalmic Hospital, describes the operation, and states that in forty cases which have been submitted to it, the deformity has been utterly extirpated without the slightest ill consequence.

On Oct. 6, a Memoir on the subject was read to the Academy of Sciences, at Paris, by Professor Jules Guérin, who stated that he had been desirous of avoiding the inflammation, suppuration, and other consequences of the external cutting, and had already operated successfully, in two cases, as follows :—The subject was placed in a horizontal position, and the head fixed. The eyelids having been separated, the globe of the eye was drawn forward, and a little to one side, by means of a proper instrument; and a small convex instrument, convex on its cutting edge, and doubly curved in the handle, was then introduced perpendicularly, at the internal or external corner of the eye, according to the muscle to be divided. The blade of the instrument having been allowed to penetrate to the whole of its depth, about fifteen millimetres, or a little more than half an inch, it was raised horizontally, by making it slide between the globe of the eye and the surface of the muscle. The convex cutting side of the instrument was then presented to the surface of the muscle, and was made to divide it from within to without, or from the globe of the eye to the side of the orbit. The globe of the eye having been drawn forward and to one side, that is to say, in the direction of the muscle that is to be divided, produces tension of the latter, and facilitates the action of the cutting instrument. The division of the muscle is attended with a cracking noise, the feeling of a resistance overcome on the part of the patient, and a small movement of the globe of the eye in the direction of the traction. The instrument is then withdrawn by the small aperture through which it was made to enter, and no appearance of a scar remains. The section of the muscle is proved to have been effected by the rotation of the eye being much facilitated, and by the diminished motion of the eye in the direction which the divided muscle used to draw it into. The operation lasted in each of the cases specified by M. Guérin less than one minute.

M. Kuhn mentioned to the Academy that he had been making some interesting experiments on the contractibility of muscles by heat, as applied to cases of partial muscular distortion. He had, among other

cases, produced strabism of the eye of a corpse by this method.—*Literary Gazette*, No. 1242.

CHANGING THE COLOUR OF THE HAIR BY INTERNAL REMEDIES.

DURING a recent discussion concerning the Growth of the Hair, at a meeting of *La Société Philomatique* of Paris, it was stated that hoary locks sometimes became black, and that there is a process by which the change can be artificially induced, and whereby red and light-coloured hair can be made black. Several instances were related, whence it would appear that the Chinese have long been familiarly acquainted with this art. Thus, M. L'Abbé Imbert came to Paris in the year 1823, to make preparations for his mission to China. At that time, his hair was of a glaring red colour; on arriving, however, at his destination, those interested in his success, to prevent his immediate detection as a stranger and foreigner, amidst a people universally black-haired, supplied him with a secret retreat, and subjected him to a constitutional and internal treatment which speedily turned into black the hair over the whole of his body; in which state he was seen by L'Abbé Voisin, and many others. M. Roulin next mentioned a fact which was communicated to him by L'Abbé Voisin, during his long residence in China: that on his arrival in the Celestial Empire, his locks had already become grey, and before he was allowed to hold intercourse with the inhabitants, "he was subjected to a treatment, consisting of internal remedies only, the result of which was to blacken his hair, not temporarily only, but permanently." M. Guérin, also, in confirmation, stated that he was acquainted with two missionaries, who had hoary locks when they set off for China, and who, on their return, had hair perfectly black. He understood this change to have been produced by an infusion of three kinds of plants, followed up by a peculiar regimen. Several of the members appeared incredulous; when M. Velpeau adduced the case of M. Rochoux, whose hair at one time was white, whilst now it is as decidedly black. In this case, it was not the result of any remedy or any course of treatment. M. Roulin, to show that the agents might have the effect attributed to them, quoted the cases of several individuals who had laboured under indisposition, and who had observed a change of the colour of their hair, under the treatment to which they had been subjected; whilst finally, it was cited that the bright feathers of the Bullfinch become quite black, if the bird be subjected to the long-continued use of hemp-seed alone as food.—*Selected from Jameson's Journal*, No. 57.

SUDDEN DEATH.

AT a late meeting of the Edinburgh Royal Society, a paper was read by Sir Charles Bell, on Sudden Death, produced by air drawn into the circulation; a fact, which has but recently attracted attention. It appears that when a wound occurs, which lays open certain arteries, the air sometimes rushes in with a hissing noise; and the individual falls dead, as if by a thunderbolt. This result has occasionally followed the amputation of an arm, or a wound in the neck: but it has been rare.

Sir Charles referred to the experiments of the French medical men; but, in opposition to their opinion, held, that the fatal effect is produced through the action of the vertebral arteries upon the *medulla oblongata*. Prof. Syme dissented from this conclusion.—*Times*.

TEMPERATURE OF COLD-BLOODED ANIMALS.

DUTROCHET has found that the temperature of the frog in the open air is 1° C. lower than that of the surrounding atmosphere; but that when immersed in water, its temperature is ·03 to ·05 C. higher than the surrounding air. The temperature of the grey lizard was 0·18° lower than that of the atmosphere. The temperature of the carp when plunged in water is the same as that of the liquid. The leech and snails are colder than the atmosphere.

ARISTOTLE'S HISTORY OF ANIMALS.

DR. OSBORNE, in a Memoir read before the Royal Society, on May 11, has made a short analysis of this work, in which he shows that Aristotle has anticipated Dr. Jenner's researches respecting the Cuckoo; as also some discoveries respecting the incubated egg, which were published within the previous year. His observations on fish and cetaceous animals are extremely curious, as might be expected from the variety of these animals abounding in the Grecian seas. Those on insects it is difficult to appreciate, from uncertainty as to the names. He describes the economy of bees, as we have it at present; but mistakes the sex of the queen. He holds the doctrine of spontaneous generation, wherever he could not detect the ovary; an inevitable conclusion arising from the want of the microscope, to which, and the want of knowledge of pneumatic chemistry, his principal errors are to be referred. The various organs are described as modified throughout the different classes of animals, (beginning with man,) in nearly the same order as that afterwards adopted by Cuvier.

Notwithstanding this body of knowledge has been buried for above 2000 years, there are in it whole sections, the separate sentences of which would furnish texts for as many Bridgewater Treatises. Its chief value, however, is, that it is a collection of facts observed under peculiar advantages, such as have never since occurred,* and that *it is at the present day to be consulted for new discoveries.*

ADDITIONS TO THE BRITISH MUSEUM.

THE Zoological Collection has received some very interesting Mammalia from Siberia, viz.—*Antelope saiga, Ant. subgutturosa*, and some small quadrupeds described by Pallas, which have not before

* According to Pliny, some thousands of men were placed at Aristotle's disposal throughout Greece and Asia, comprising persons connected with hunting and fishing, or who had the care of cattle, fish-ponds, or apiaries, in order that he might obtain information from all those quarters, *ne quid usquam gentium ignoraretur ab eo*. And, according to Athenæus, the same prince gave him, on account of the expenses incurred in composing it, 800 talents—a sum, which, taken at the lowest, that is, the lesser Attic talent, amounts to above £79,000.

been seen in Western Europe. Captain George Gray has presented to it some specimens which he has collected during his travels in New Holland; and Mrs. Dunn has sent a series of Shell and Radiated Animals from New Zealand, which she had received from Mr. Busby. These, with the Shells which the Museum received some time since from the Rev. Mr. Yates, show the great riches we are to expect from these islands when they are properly explored.

The eastern gallery of the British Museum, which was formerly occupied by the collections of Minerals, having undergone a complete repair, has been reopened to the public, with the collections of Birds and Shells: the room is 300 feet long, and 50 feet wide, and contains one of the richest ornithological collections in Europe. The cases are glazed with large panes of plate-glass, with very numerous brass bars; and the smaller Birds are arranged on a new plan, on box shelves, each bird having a close back-ground, so as to show its outline distinctly and relieve its colours; and the Shells, occupying forty table cases, are exhibited on black velvet, which gives them admirable relief.—*Annals, and Mag. Nat. Hist.* No. 38.

THE ZOOLOGICAL SOCIETY.

At the Annual Meeting, held on April 29, the number of Fellows, or contributing Members, was stated to be upwards of 3000. The Menagerie, on the 1st of April, contained 910 subjects, including 303 mammalia, 527 birds, and 20 reptiles; several species being new to this country. The Museum of the Society was alluded to with satisfaction,—it now rivals any on the Continent; the arrangement is almost perfect: the shelves, however, are so crowded, that numerous rare specimens are kept in stores. It contains 1794 specimens of mammalia, comprising 800 distinct species; 5418 birds, comprising 3000 species; fishes, 1260; reptiles, 1034; the osteological collection, 386 perfect skeletons.

THE NATURAL SYSTEM.

Mr. Strickland has read to the British Association a paper "On the True Method of Discovering the Natural System in Zoology and Botany;" the object of which communication was to show that the affinities of species and groups follow no regular or symmetrical order, such as is exhibited in artificial systems, but that they radiate and ramify irregularly in all directions. He, consequently, inferred that the only means of arriving at a knowledge of the true system is, to discard all *à priori* considerations, and to trace out and delineate the affinities of species by an inductive process, similar to that of a geographical survey. To do otherwise is not to follow Nature, but to clip her into forms, as we see yew-trees clipped by eccentric gardeners. In illustration of this he exhibited some sketch maps, intended to shew the true order of affinities in certain families of birds.—*Literary Gazette*, No. 1239.

PERMANENCE OF SPECIES.

On June 29, M. Geoffroy St. Hilaire announced to the Academy of

Sciences, at Paris, that there had been born at the Garden of Plants, on the 26th, a Fawn, the father of which was a species peculiar to Java, or, at least, which had not been met with out of the Sunda Islands; and the mother was the Axis of continental India. This, he observed, would tend to modify the doctrine of permanence of species.

DISTINCTIONS OF PLANTS AND ANIMALS.

On May 21, Mr. J. Sowerby read to the Botanic Society, a short paper "Upon the Distinguishing Characters by which a Plant may be known from an Animal." Having detailed the constitution of minerals and animals, he remarked that the latter have within themselves the power of secreting the materials required for their growth, of producing the necessary change by respiration, and collecting crude materials in a stomach; that plants require the stimulus of light, and have no stomach; while animals have a nervous system, which plants have not. He then stated that there are many organized beings which have motion, and consequently a nervous system, but which cannot live without light, and have no stomach: these he proposed should be placed in a new kingdom, between plants and animals, in accordance with a suggestion lately made by Mr. Edwards to the Microscopical Society.

ZOOLOGY OF MALAYA.

On June 25, Mr. T. C. Eyton, in presenting to the Linnæan Society a "Catalogue of a Collection of Birds from Malaya," observed: "the Zoology of Malaya is altogether highly deserving of the attention of the naturalist, presenting, as it does, a connecting link between those families of which Australia is the metropolis, and the forms of the Old World. The ornithology of Australia is distinguished by the number of species belonging to the *Melaphagidæ*, which it produces; and we find, from two catalogues here mentioned, that the Indian islands and the Malayan peninsula also possess a greater number of species belonging to this family than any other portion of the world, excepting Australia. This transition may also be traced through the marsupial animals and man, the Malay variety of the human species approaching nearer to the Australian than any other, in the form of the cranium.—*Annals Nat. Hist.*, No. 27; *abridged.*

THE IRISH FAUNA.

Mr. Patterson has read to the British Association, the Report of Mr. Thomson, "On the Vertebrata of the Irish Fauna," which, when complete, will enable the British naturalist to ascertain what is the extreme western range of his species. From the different circumstances which influence the distribution of animals and plants, we do not find species of the former in Ireland, resembling those of the Continent, as we do in the latter; and the animal kingdom has no representative of *Erica Mediterranea, Menziesia polifolia, Arbutus unedo*, &c. The Fauna of Ireland is compared with that of Great Britain, but the former ranges over only 4° of longitude, whilst the

latter is double. The *physical* character of Ireland would make but little difference, although elevation may be the cause of the existence of two vertebrals—the ptarmigan, *(Tetrao lagopus,)* and the Alpine hare, *(Lepus variabilis)*. They may, however, be influenced by *climate*. The difference of temperature between Ireland and Great Britain does not attract or repel animals from one to the other; otherwise it has an influence. The stoat, *(Mustela erminea,)* very rarely changes its garb in Ireland. Birds, even in the north, which are migratory in Britain, are stationary in Ireland, as the quail, *(Perdix coturnix)*. Many of the soft-billed birds sing throughout the year, which are silent in winter in Great Britain. Although the Cyprinidæ, (among fishes,) increase towards the south of Europe, there are fewer in Ireland than England. The *Scolopax rusticola*, *S. gallinula*, *S. gallinago*, and *Sturnus vulgaris*, are more abundant. Mammalia are fewer than in Great Britain. *Cheiroptera* are remarkably deficient. In the genus *Mus* there is one, not found elsewhere :—*M. Hibernicus*. The squirrel and dormouse are absent, and there are no examples of *Arvicola*. *Lepus Hibernicus* is known only to Ireland. The polecat, *(Mustela putorius,)* is unknown. *Mustela vulgaris* is much more rare than *M. erminea*. The mole, *(Talpa Europæa,)* is absent. Of *Sorex*, there is but one species, called provisionally by Mr. Jenyns, *S. Hibernicus*. Of Birds, the species that appear in Great Britain, and not in Ireland, are chiefly occasional visitants. There are no Ophidian Reptiles in Ireland. In Amphibia, the toad, *(Bufo vulgaris)*, is absent; and the frog, *(Rana temporaria,)* is said to have been introduced. The natterjack, *(Bufo calamita,)* is only indigenous to Kerry. Tritons prevail. In fish, the families in which there is greatest deficiency, compared with Great Britain, are, *Percidæ*, *Sparidæ*, *Teniodidæ*, and *Raiadæ;* there is a deficiency of fresh-water fishes. The number of species are Mammalia, 29; Aves, 230; Reptilia, 2; Amphibia, 3; Pisces, 150. The Report terminated with the expression of a hope, that the invertebrate animals will be included next year.—*Athenæum*, No. 675.

PRESERVATION OF ANIMAL AND VEGETABLE SPECIMENS.

THERE has been read to the British Association, the Report of Prof. Henslow and Committee, "On the preservation of Animal and Vegetable Substances." The attention of the Committee has been directed to the preserving properties of certain materials when applied separately, either in saturated solutions, or in different degrees of concentration. The experiments have been conducted in glass jars 6 inches by 1½; and saturated solutions of the substances employed having been prepared, were diluted with an equal, and double, quantity of water. 178 preparations of Animal and Vegetable substances were tried. 1. Results obtained with animal substances. Three salts of potassa—the subcarbonate, the bicarbonate, and the arseniate, have afforded the most satisfactory results. The solution of the bicarbonate yielded a flocculent precipitate: the solution half saturated appeared the best adapted. The substances preserving next best are,

sulphate of zinc, muriate of magnesia, and arsenious acid. After these may be mentioned sulphate of magnesia, sulphate of potassa, and alumina, (common alum), muriate of ammonia, sulphate of potash. Corrosive sublimate is a perfect preservative of animal substances; but this salt renders the substances so very hard, that singly it is unsuited to the purposes of natural history; added in small proportions to other solutions, which render objects too soft, it will probably be found of essential service, as well also in preventing the formation of flocculent matter. One part of naphtha to seven of water produces a favourable result; but when used stronger, the specimens are rendered tough. Acetic and oxalic acids decompose the skin and cellular membrane of fish, but leave the muscles untouched. A few drops of kreosote added to water, preserve the objects, but they become stained dark brown. The following substances are entirely unfit for preservatives: carbonate of ammonia, chloride of potash, muriate of barytes, muriate of lime, nitrate of ammonia, nitrate of strontian; the nitrates of barytes, soda, ammonia, and magnesia; phosphate of soda; the sulphates of soda, potash, iron, copper; and rough pyroligneous acid. 2. Results obtained with vegetable substances. The success here is very slight. None of the salts seem favourable, with the exception, perhaps, of the subcarbonate and bicarbonate of potash. In naphtha and acetic acid, the specimens are preserved; but in the latter they lose their colour, and assume a reddish tinge. Prof. Henslow adds, in a note, that, although carbonate of soda of the shops is not mentioned in the Report, he finds it to possess considerable preserving powers on animal substances.

Dr. Balfour observed, that he had seen Fruits and other parts of Vegetables preserved well in a solution of common salt in water. Arsenite of potassa also preserved the colour of flowers well. As a general rule, he believed that salts containing oxygen would not preserve animal substances. Passing from the dead to the living, Sir John Dalyell stated that he had in his possession an actinia, which he had kept alive twelve years, another eight years, a holothuria two years, and other animals of the same class, of varying ages. He found it necessary to change their water every four or five days; when kept longer they became weak, and incapable of sustaining themselves with their suckers. The actiniæ will live a long time without food. They feed on small fish, crustacea, and conchifera. The food of the holothuria he was not certain about. A young skait he kept would eat nothing but whiting.—*Athenæum*, No. 674; *abridged*.

M. Salomon directs, that Reptiles especially be immersed for two months in strong alcohol, and then placed in a stove, heated to 104°, until they are completely dried. After this preparation, they may be kept for any length of time without exhaling any disagreeable odour. —*Athenæum*, No. 620.

THE AGILE GIBBON, OR UNGKA-PUTI.

An interesting female of this species of Gibbon was exhibited at the Egyptian Hall, Piccadilly, during July and August last; whither she

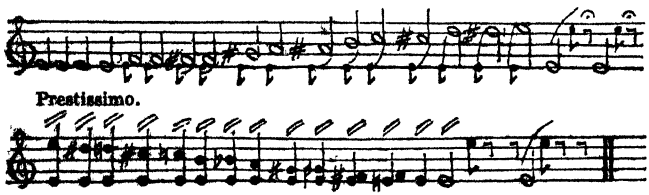
was sent by the Clifton and Bristol Zoological Society. She is a full-grown female of the Ungka-puti, or pale variety, *(Hylobates agilis*, F. Cuv.) and displayed such agility, power, and address, as to confirm all that M. Duvaucel has remarked respecting the activity of the animal in its native forests; but her intelligence is of a far higher order than he is willing to attribute either to this or any other Gibbon. Her height is about 2 feet 6 inches, and the breadth across the shoulders, and from finger end to finger end, 6 feet.

Previously to her arrival in England, this animal had lived for four years in Macao, where she is stated to have occasioned the death of a man by lacerating him with her long canine teeth. Her countenance, surrounded by a full brown-black beard, displays cunning and mistrust; her eyes are expressive, and her gaze is often earnest and inquiring. When at rest, her favourite position is that of sitting in a crouched attitude, at the fork of one of the branches of a tree, so as almost to shroud herself from view; and from this post she watches intensely every thing that passes around, or the motions of any person endeavouring to gain a sight of her. It is not without impatience that she submits to discipline: she has often turned upon her keeper, and struggled with him for the mastery. It is almost impossible to convey in words an idea of the quickness and graceful address of her movements: they may, indeed, be termed aërial, as she seems merely to touch, in her progress, the branches among which she exhibits her evolutions. In these feats, her hands and arms are the sole organs of locomotion; her body, hanging, as if suspended by a rope, sustained by one hand, (the right, for example,) she launches herself, by an energetic movement, to a distant branch, which she catches by her left hand: but her hold is less than momentary; the impulse for the next launch is acquired; the branch then aimed at is attained by the right hand again, and quitted instantaneously, and so on, in alternate succession. By this manner, spaces of 12 and 18 feet are cleared with the greatest ease, and uninterruptedly, for hours together, without the slightest appearance of fatigue: and it is evident that if more space could be allowed, distances very greatly exceeding 18 feet would be as easily cleared; so that Duvaucel's assertion, that he has seen these animals launch themselves from one branch to another, 40 feet asunder, startling as it is, may be well credited. Sometimes, on seizing a branch in her progress, she will throw herself, by the power of one arm only, completely round it, making a revolution with such rapidity, as almost to deceive the eye, and continue her progress with undiminished velocity. It is very singular to observe how suddenly this Gibbon can stop, when the impetus, given by the rapidity and distance of her swinging leaps, would seem to require a gradual abatement of her movements. In the very midst of her flight, a branch is seized, the body raised, and she is seen, as if by magic, quietly seated on it, grasping it with her feet. As suddenly, she again throws herself into action.

The voice of this Gibbon is extraordinary, not only for its power and volume, but for the succession of graduated tones in which its cry is

uttered. In a room it is overpowering and deafening: it consists of a repetition of the syllables oo-ah, oo-ah, at first distinctly repeated, and ascending in the scale, but at last ending in a shake, consisting of a quick vibratory series of descending notes, during which the whole of the animal's frame quivers with the effort to produce them: after this, she appears to be greatly excited, and violently shakes the netting or branch to which she may be clinging; which action being finished, she again traces her cage, uttering the preliminary syllables oo-ah, oo-ah, till the shake again concludes the series. It is principally in the morning that the animal thus exerts this undulated cry, which is, probably, its natural call to its mate; and which, from its strength, is well calculated for resounding through the vast forests.

Mr. Waterhouse has endeavoured to give an idea of the whooping of this Gibbon, (as far as the music is concerned, but not as regards the quality of sound,) by comparing it to the tuning of a harp; first beginning with an E string, and repeating it at short intervals; then being altogether silent for a little time, and then beginning again; next, two strings, as it were, are struck, E and E sharp (or F natural): the second string is then screwed up, by half-notes, until it reaches the octave; the E and F natural, E and F sharp, E and G natural, &c., being nearly struck together. It must be observed, that, before the upper note arrives at the octave, the animal amuses herself by occasionally descending a few semi-tones, then ascending again, and so on. But when the octave is once gained and has sounded a few times, we may imagine the upper string to be very rapidly let down by semitones; the lower note remaining the same as at first, and the two strings being always struck together*. The rapidity of the descending passage is equal to that of an extremely brilliant shake. The animal then remains quiet for a short time; after which follow two barks, each composed of the low and high E, sounded nearly together.



It appeared to Mr. Waterhouse that, in ascending and descending the scale, the intervals were always exactly half-tones; and he is sure that the highest note was the exact octave to the lowest. In this passage, the lips were engaged, and rapidly vibrated during its execution. The quality of the notes is very musical; and it is not doubted that a good violinist would be able to give a correct idea of the Gibbon's com-

* It appears, all through this rapid chromatic passage, as if the animal emitted two notes at a time, as in the music: but this is the effect of the rapid transition from the lower note to the upper.

position, excepting as regards its loudness. The Gibbon's voice is certainly much more powerful than that of any singer Mr. Waterhouse ever heard. She is usually a long time before she comes to the rapidly descending passage; but when she has given it once, she soon runs through the preliminary part of her composition, and again comes to the descending passage.

With regard to the intelligence of this Gibbon, it is, certainly, far superior to that of the lower Monkeys; though, perhaps, not so high as that of the chimpanzee. She disengages, with judgment, the loops of a rope or chain, which, by being entangled, would impede her progress; and she ascertains the direction of each coil before attempting to untwine it, performing the task with great precision*.

ALLEGED NEW BAT.

The White Bat, *(Vespertilio ædilis, Jenyns,)* described and figured in the *Year-Book of Facts*, 1840, pp. 195-6, as a new species, has been compared with *V. Daubentonii*, with which it agrees so closely, that it must, in every respect, be referred to that species.—See *Wiegmann's Archiv*. Part I. for 1840.

WORM IN THE EYE OF A HORSE.

Dr. Dunglison has related to the American Philosophical Society a curious but not unique case of a Worm in the Eye of a Horse, at Baltimore. This entozoon is a species of filaria, (see *Filaria papillosa*, Rudolphi, Synops. p. 213,) probably, from 3½ to 4 inches in length, and situate in the aqueous humour in which it moves about with great activity; but its motions are so constant that it is difficult to appreciate its exact length. The great size of the anterior chamber of the horse's eye affords it ample space; and through the transparent cornea, it can be observed as well as if it were in a glass vessel. Dr. Dunglison, in explaining the difficulty of accounting for its presence in this shut sac, alluded to the different views of distinguished naturalists as to the generation of many of the lower tribes of the animal kingdom,—some presuming that they may be formed spontaneously, whilst others consider that the germs must always be received from without. The difficulty, he observes, applies to all entozoa that infest the animal body; and this case is certainly not more difficult of explanation than that of entozoa found in the intestines of the fœtus in utero.—*Annals Nat. Hist.* No. 33.

HYDROPHOBIA AND CANINE MADNESS.

On Sept. 21, M. Breschet communicated to the Academy of Sciences, at Paris, some interesting results of experiments "On the Transmissibility of Hydrophobia and Canine Madness to the Human Species, and to all other Mammalia." He considered it of importance

* We have abridged these interesting and accurate details from Part viii. of Mr. Martin's *Natural History of Quadrupeds, and other Mammiferous Animals*, a work of great discrimination and sound knowledge; the publication of which was commenced during the past year. The Memoir is accompanied [illegible], drawn by Mr. W. Harvey.

to distinguish carefully between hydrophobia and canine madness, because the former was a symptom of various fevers, and was not necessarily attended by death; whereas, the other was always fatal, but was not always accompanied by hydrophobic symptons. He had inoculated a dog with the saliva of a patient who died of canine madness, and the animal went raving mad and died. Dogs had bitten, while in a state of madness, asses and horses; and these latter animals had shown all the symptoms of the same disease, though the horse was not so much affected as the ass. It had been observed by him, that by successively inoculating dogs with the virulent saliva, one from the other, the disease gradually lost its intensity; as, also, that the blood of a rabid dog injected into the blood of one in a sound state of health, had even produced madness. Rabbits and other small animals, as well as birds of various kinds, had been inoculated by M. Magendie and himself with the saliva of a rabid dog, but they showed no signs of madness, though they *all* died soon after. The period for the rabid symptoms first manifesting themselves after inoculation was from twenty-five to forty days. He had given abundant liquors to a dog in a rabid state of madness, and had even poured them down his throat, the animal showing no repugnance to it; on the contrary, the dog drank readily. — *Literary Gazette*, No. 1238.

BLACK HAMSTER.

Dr. Weissenborn, of Weimar, has presented to the Zoological Society two specimens, (male and female,) of the black variety of the common Hamster, *Cricetus vulgaris*; and a head, preserved so as to display the cheek pouches of that animal.

HORNS OF RUMINANTIA.

Speaking of the raised ridges and annuli on the horns, Mr. Ogilby states, that the number of these added in a given time appears to be very variable. "The common cow is generally supposed to acquire one ring on the horn every year after the third, but this is far from being a general law. Between the 20th of July and the 31st of October, 1833, the horns of a young Indian Antelope, (*A. Cervicapra*) marked for the purpose in the gardens of the Zoological Society, acquired an addition of no fewer than three rings, and an increase of length of a full inch and a half;" and Mr. Ogilby states that he has observed a similar phenomenon in other species.

Among the high mountains of Glenorchy, Glenlyon, and Glenlochay, there have been met with several times during the winter of 1838-9 upon the snow, the tracks of an animal, seemingly, unknown at present in Scotland. The print of the foot in every respect is an exact resemblance of that of a foal of considerable size, with this small difference, perhaps, that the hoof seems a little longer, or not so round; but as no one has ever had as yet the good fortune to have

obtained a glimpse of this creature, nothing more can be said of its shape or dimensions; only it has been remarked, from the depth to which the foot sunk in the snow, that it must be a beast of considerable size. It has been observed, also, that its walk is not like the generality of quadrupeds; but that it is more like the bounding or limping of a hare when not scared or pursued. It is not in one locality only that its tracks have been met with, but through a range of at least twelve miles.—*Perth Courier.*

NEW MARSUPIAL ANIMAL.

THIS animal, in the collection of Mr. Tucker, the naturalist dealer, has been named after him, by Mr. Gray, *Perameles Tuckeri*, n. s. Head short, conical; ears large, hairy, coloured like the back, with a blackish edge; fur soft, brown, varied with grey hairs, and black tips; sides yellow-brown, beneath yellowish grey, under fur of black, lead-coloured; tail as long as the body, tapering, hairy, and coloured like the body at the base, blackish, and with rather adpressed hairs for two-thirds of its length. Length of the head, 2¼, of the body 5¾, of the tail 5¾, of hind foot 2¼ inches.—*Annals Nat. Hist.* No. 29.

WHALE FISHERY IN THE NORTHERN SEAS.

FOR many years of late remarkable changes have taken place in the circumstances of this species of fishery, which every day become more and more perceptible. The Whale Regions are no longer the same as formerly. Originally, the seas situate between Spitzbergen and Greenland were frequented; these were afterwards totally abandoned. Whalers gave the preference to Davis's-straits, Baffin's-bay, or the seas to the east of Greenland. At the present time, Davis's-straits appear on the point of being deserted in their turn; France no longer sends any ships there; Holland sends only one or two; England, which formerly sent upwards of 200 ships to these regions, in 1832 only sent 81. The number is now much less, and will still doubtless continue to diminish, for the results of the last expedition were very unsatisfactory. It is probable that the English will, ere long, renounce the dangers of so laborious and difficult a navigation, in order to devote themselves, like the French and the Americans, to the fishery in the more temperate regions of the south.—*Le Commerce; Times.*

RORQUAL WHALE ON THE COAST OF DORSET.

ON Feb. 11, Mr. Yarrell communicated to the Zoological Society, on the part of R. H. Sweeting, Esq. some facts relating to a female Rorqual Whale, (*Balænoptera boops* of authors), which was stranded near high-water mark at Charmouth, Dorsetshire, early in the morning of Feb. 5, 1840. The whole length was 44 feet; girth, 21 feet; breadth of tail, 9 feet: probable weight from 20 to 25 tons. The plates of "whalebone" amounted to upwards of 250 on each side of the jaw. The opening of the eye was 6 inches in length, from canthus to angle; the bony socket from anterior to posterior margin,

8 inches; eyeball, 7 inches; the pupil oval; the irides hazel. There was not the slightest appearance of eye-lashes, which some authors state whales possess. The subcutaneous layer of fat varied in thickness from 3 to 5 inches. The skeleton measured 40 feet in length; head, 10 feet.

MIGRATION OF BIRDS.

SIR THOMAS PHILLIPS has communicated to the British Association, that so long since as 1684, observations were made on the Migration of Brent Geese from the barony of Forth, in the county of Wexford; and Mr. Vigors has confirmed the truth of this statement at the present day. Mr. Selby has related an instance of all the sparrows having deserted a certain district in Rosshire. These facts show the permanence of the instinct of the birds, and the punctuality of their returns and departures, which have been observed, for many years, to occur on the same days.

RETURN OF MR. GOULD.

MR. GOULD, the celebrated ornithologist, has returned from Australia, after an absence of two years and a half, which he has devoted to an investigation of the habits and economy of the animals of that portion of the globe. Among other interesting materials which he has brought home for illustrating his work on the Birds of Australia, are the nests of eggs and a great portion of the species.—*Annals, and Mag. Nat. Hist.*

PURPLE MARTIN OF AMERICA.

A FEMALE specimen of this bird, (*Hirundo purpurea*), the Purple Martin of the American ornithologists, has lately been shot near Kingston, county of Dublin; and is now preserved in the Museum of the Royal Dublin Society.

EAGLES IN SCOTLAND.

EAGLES are now rarely seen in the Highlands; for the march of improvement is driving them to the remotest mountain solitudes—a pair having built, (above 50 years, it is said) near the entrance of the Pass of Inverfarigaig, on the banks of Loch-Ness; and eagles are still seen in the western parts of Invernesshire. In Sutherland, a majestic eagle was lately caught in a large trap, which it had strength to carry to a considerable distance, till both fell into a lake. Mr. James Richmond, gamekeeper to Mr. Gladstone, of Liverpool, has, from September, 1839, to June, 1840, trapped six eagles on a high hill on the farm of Auchnasheen, in Rosshire. One of these eagles measured from tip to tip of the wing 8 feet 2 inches, and the span of his claws was 6½ inches. The same gamekeeper has also taken a number of Wild Cats; one measuring in length 3 feet 10 inches; and another, 3 feet 8 inches.—*Abridged from the Inverness Courier.*

ANOMALOUS PIGEON.

DR. WEISSENBORN, of Weimar, possessed, in July last, a common

Pigeon, just fledged, in which no vestiges of the organs of vision could be traced. The orbits were tolerably well developed, and lined with a sort of half-mucous membrane, and, therefore, destitute of feathers. The Doctor has never heard of a similar defect in any animal; and in one where the incubation is extra-uterine, it appears doubly wonderful or anomalous. The bird is quite healthy, and presents in its habits several curious anomalies, which may be traced to its monstrosity.

FOOD OF HUMMING BIRDS.

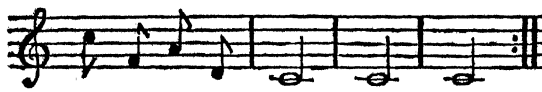
On April 4, Prof. Traill communicated to the Wernerian Society some remarks on the food of the genus *Trochilus*; and stated that having frequently dissected different species, which had been put into spirit when recently killed, he had invariably found the expansion of their œsophagus corresponding to the crop of granivorous birds, to contain insects, and, in some instances, to be completely stuffed with them; among which he had never observed any apterous insect. In a specimen of *Trochilus viridissimus*, opened in presence of the meeting, two species of dipterous insects were found. From these observations, Dr. Traill inferred that Alexander Wilson, and some other naturalists, were not only right in asserting that insects were occasionally eaten by humming-birds, but that the chief object of their fluttering about flowers was more for the purpose of their obtaining insect food, than for the alleged object of sucking the honey, from the nectaries of plants.—*Jameson's Journal*, No. 57.

Prof. Traill adds some further observation supon the anatomyof these birds' tongue and the os hyoides. The long and extensile tongue is extensively bifid in a horizontal direction, one of the forked portions lying above and over the other. Both of them are tubular; an observation based upon his personal observation, and in contradiction to the denial of some reputable naturalists, whose error he conceived arose from their observation having been made on dry and not fresh specimens. The upper side of the tongue is rugous, and the point, especially of the upper part, almost bony. Hence he esteems its functions threefold: 1. From that portion of the tongue which is nearest the point being supplied with an adhesive secretion, a portion of its food, as in the Bee-eater, readily adheres to it; 2. in a degree prehensile, it discharges the functions of a hand; and, 3. with the sharp hard point of the upper filament, it possesses the power of impaling and retaining its victims. With regard to the os hyoides, its cornea are, as in the Woodpecker, much elongated, and curved round behind the head: to this powerful muscles are attached, and hence the rapidity and vigour of the motions of the member.—*Annals Nat. Hist.*, No. 31.

On Feb. 11, Mr. Fraser pointed out to the Zoological Society the characters of eighteen new species of Humming-birds, which were obtained at Sta. Fé de Bogota, a great portion of which had not been hitherto described.

HABITS OF A BIRD OF PARADISE.

On Feb. 11, Mr. G. T. Lay read to the Zoological Society an account of the habits of a Bird of Paradise, (*Paradisea apoda*, Linn.) which had been in the possession of Mr. Beale, in China, upwards of fourteen years. It is fed mainly upon boiled rice, with a few grasshoppers, as meat with its vegetables. The voice is loud and sonorous, when the bird calls in a rapid succession of notes. This is, probably, the strain in which he answers his fellows in the wild state, and may be heard, from its clearness, at a great distance. When you approach his cage, his "song of solitude" is short, but very pleasing, and not a little curious, for the notes are repeated in harmonious progression.



The first four notes are very exactly intonated, very clear, and very sweet. The three last are repeated in a kind of caw, a very high refinement of the voices of a daw or a crow, yet possessing a striking resemblance. And this suggests a lively affinity between the crow and the Paradise-birds. While this serenade is uttered, the black pupil, encircled by a golden iris, waxes or wanes, as the creature wishes to contemplate more distant or nearer objects. The bill snaps as the prelude of a meal and the token of an appetite, while the body is conveyed from side to side by the highest and most easy springs. The crow and its congeners love to range upon the ground, as having feet formed for walking; but the Paradise-bird shuns the bottom of the cage, as if afraid of soiling its delicate plumage. It is always as clean and wanless as it is gay and splendid. In the wild state, this bird not unlikely catches its prey upon the wing, either by taking it in flight, like the swallow, or by darting upon it, like the Drongo Shrike, as it passes by the seat of its pursuer.

THE STORMY PETREL.

During the violent hurricanes in November, occurred two remarkable instances of the Stormy Petrel, (*Procellaria Pelagica*,) found far inland. The first, a fine specimen, was picked up on ...ot Heath, by Lord William Beresford. The bird is about seven ...s in length, and its wings measure, from tip to tip, sixteen inches. The second specimen was taken up in a state of exhaustion, at Netherfield, four miles from Birmingham.

RELIC OF AN UNKNOWN STRUTHIOUS BIRD.

The bone of an unknown Struthious Bird of large size, presumed to be extinct, has lately been sent to England from New Zealand, where the natives have a tradition that it belonged to a bird of the Eagle kind, but which has become extinct, and to which they give the name "Movie." Similar bones are, it is said, found buried in the banks of the rivers.

The fragment, which is the shaft of a femur, with both extremities broken off, has been examined by Professor Owen, who states there to be no bone of similar size which presents a cancellous structure so closely resembling that of the present bone as does the femur of the Ostrich; but this structure is interrupted in the Ostrich at the middle of the shaft, where the parietes of the medullary, or rather air cavity, are smooth and unbroken. From this difference, Mr. Owen concludes the Struthious bird, indicated by the present fragment, to have been a heavier and more sluggish species than the Ostrich. In the fragment being cylindrical, it approaches nearer to the femur of the Emeu; but its diameter is one-third greater than that of the largest Emeu's femur, with which Mr. Owen has compared it. It does not present the characters of a true fossil: it is by no means mineralized; it had, probably, been on or in the ground for some time, but still retains most of its animal matter. It weighs 7 oz. 12 drams, avoirdupois.

This discovery of a relic of a large Struthious bird in New Zealand is one of peculiar interest, on account of the remarkable character of the existing Fauna of that island, which still includes one of the most extraordinary and anomalous genera of the Struthious order; and because of the close analogy which the event indicated by the present relic offers to the extinction of the Dodo of the island of the Mauritius. So far as a judgment can be formed of a single fragment, it seems probable that the extinct bird of New Zealand, if it prove to be extinct, presented proportions more nearly resembling those of the Dodo than of any of the existing *Struthionidæ*.

In fine, from this osseous fragment, Mr. Owen ventures to state that there has existed, if there does not now exist, in New Zealand, a Struthious bird, nearly, if not quite, equal in size to the Ostrich.—*Abridged from the Annals of Nat. Hist.*, No. 30.

ORNITHORHYNCHUS HYSTRIX.

On May 28, Dr. Davy read to the Royal Society a notice relative to the Blood of the *Ornithorhynchus hystrix*, a portion of which, mixed when fresh with a strong solution of common salt, exhibited a few globules of irregular shape. Another portion, preserved in syrup, contained numerous globules, most of which had an irregular form, but many were circular; none, however, were elliptical, like those of birds. Hence, the author concludes that in form they accord more with those of Mammalia.

STRUCTURE OF FISHES.

Dr. Macdonald has read to the British Association an important paper, the object of which is chiefly to correct the erroneous views of the analogy between the limbs of higher vertebrals and the fins of Fishes,—errors entertained not merely by the more superficial compilers of the embellished picture-books, and illustrations of Natural History,—but also by naturalists and anatomists of the highest rank. It was possible to point out, by means of the class of fishes alone, that the generally received analogies were erroneous. The pectoral fin

has usually been considered the analogue of the wing of a bird, and the ventral fin that of the leg; whereas, from the anatomical structure of the pectoral fin, it is really the analogue of the hind leg of the higher vertebrals. In order to admit the views of Cuvier and others, what will really be found to be the pelvis, femur, and fibula, it is necessary to consider these three distinct bones as forming the scapula. In the haddock, cod, &c., there is a beautiful articulation or acetabular joint, which is never found in any scapula, even when it consists of more than one piece. The tibia is considered the clavicle, and the tarsus has to provide for the whole bones of the arm, fore-arm, and hand: thus, while a prodigal waste of bone is bestowed en the scapulo-clavicular arch, the whole limb is supplied by the foot. An opposite system is found in the case of the ventral fins, where the whole pelvis and the two posterior extremities are represented by two bones supporting the rays of the fins. If, however, the pectoral fin be considered analogous to the pelvis and leg, the whole becomes changed; and it will be found that the supra-scapular bone is the os innominata with the acetabulum on its inner aspect—the scapula: the femur having its articulation turned and connected with the tibia on its surface; and thus what is the inside of the leg in mammals, is external in the fish; and what is in man the inner malleolus, is in fishes external, and so fully developed till it meets with the corresponding part of the opposite side, forming a firm arch under the respiratory region. The coracoid process will be easily recognised as the fibula, and the bones supporting the fin rays, instead of representing the whole arm, fore-arm, carpus, and fingers, will be the tarsus; characterized as it almost always is in mammals by having its bones arranged somewhat like the bones of the fore-arm and hand. This is demonstrated on the human skeleton. The ventral fins may be considered as the pubis.

Next, if the question were asked,—Where is the arm? the author refers to the opercular bones, which Geoffroy St. Hilaire mistook for the enlarged bones of the ear. The opercular bones being found in osseous fishes, and connected with branchial respiration, are also found in the *Proteus* of America, as may be seen by referring to the drawings of Humboldt; but, as that animal has a pulmonic as well as a branchial respiratory system, we there find the more fully developed osseous arch of higher vertebrals. In the extensive class of fishes alone, we find the anterior extremity more fully developed, as in the cartilaginous rays, where the greatest part of the fish is composed of the hand, while the pelvis and legs are connected with the spine further down; and in the *Lophius piscatorius* (a specimen of which was exhibited), there will be found connected with the opercular bones a set of five rays; still, as these do not protrude, but are merely imbedded in the substance of the skin, they have never been honoured by the gaze of systematizers of circular zoology. The use of the limb in the retroverted position, with the sole of the foot having an anterior aspect, will be principally applied to steadying the fish in its proper position, and backing out, the whole progression depending on the motion of the tail. The greater development of the posterior than

the anterior extremity, is not confined to fishes; in the tadpole it will be found first developed, and in the adult frog it is always much larger.—*Athenæum*, No. 674.

SCALES OF FISHES.

In the *Year-Book of Facts*, 1840, p. 184, appears a notice of M. Mandl's support of M. Agassiz, respecting the structural peculiarities of the Scales of Fishes; whereas, by a paper addressed to the Academy of Sciences, at Paris, in February last, these philosophers differ materially in their conclusions. Among the discrepancies is the following, pointed out by M. Agassiz; "M. Mandl alleges that I am mistaken in affirming that *scales are composed of* superimposed plates. He assures us, on the contrary, that they are formed of *cells placed near each other*. He even attempts to demonstrate this in the scales of the roach; and yet, in this very fish, I have succeeded in separating the plates of growth from each other, which, in numerous transverse sections of different scales, I have seen, with a magnifying power of 250 times the diameter, the superposition of these plates throughout the whole thickness of the scales. I have even already published a figure of such a section of the scale of *Salmo Trutta*, in my *Natural History of Fresh-water Fishes.*"

Dr. Agassiz's conclusion is laconic: "I shall enter into no further details on the structure of the scales of fishes, *but merely conclude from my recent observations, that the description I formerly gave of them is correct, and that Dr. Mandl's mode of regarding them is, in every respect, erroneous.*"

Dr. Mandl's paper, illustrated with engravings, is contained in *Jameson's Journal*, Nos. 55 and 56; and M. Agassiz's refutation in the latter Number of that work.

FISH IN HOT SPRINGS.

M. Tripier has discovered, in Constantina, a kind of Barbel living in a large natural reservoir formed by the thermal springs of Hammanmes-Koutin, the permanent temperature of which, for more than 150 years, has never varied from 95° Centig. (202 Fahr.) or almost boiling water, in which the fish enjoy themselves; whilst date-trees flourish round the borders of the basin.—*Literary Gazette*, No. 1203.

ORGANS OF SENSE IN THE SALMON.

Dr. Lizars has read to the British Association, a paper "On the Organs of Sense in the Salmon." After alluding to the importance of combining the investigation of the structure of animals with their external character, and stating that the anatomy of the Salmon had hitherto been almost entirely overlooked, he proceeded to describe it, and the functions of the organs of the senses in this animal. Having dissected the skin, he arrived at the conclusion that it was not very highly organised for the function of touch. He arrived at the same conclusion with regard to the organ of taste. The organs of smell, sight, and hearing, he minutely explained, and demonstrated satisfac-

Do they all pass certain periods of torpidity before arriving at their full growth? 3. Do they reproduce after each period of rest, or not till they have arrived at their full growth, or nearly attained to it? 4. After arriving at full growth, how often do they reproduce before they die? 5. May it not be supposed that, during each of these periods of rest, certain changes are produced in their organization, which may answer some such end as the pupa state amongst insects; or, at least, may effect the purpose of consolidating or perfecting the last new growth which has been hastily sketched out during the feeding period?

The determination of the length of the periods during which these animals remain in a state of rest or activity, would be highly interesting, and might easily be accomplished by any one residing for a year, or perhaps, half that time, in a tropical climate; as there is little doubt that all animals of the same kind and genera have similar habits in the same latitudes throughout the world.

PARASITICAL CRUSTACEA.

On Oct. 12, M. Duvernoy read to the Academy of Sciences, at Paris, a memoir "On a newly discovered Parasitical Isopodal Crustacea," which he considered might form a third family in the section of Mr. Milne Edwards' sedentary isopodal crustaceous animals. They were found on the under sides of the bronchiæ of the prawn. He had examined them carefully with powerful microscopes, and gave an account of their formation. They were to be considered as intermediate between the families of the *Bopyri* and the *Ione*s.—*Literary Gazette*, No. 1240.

BYSSUS OF THE UNIO.

Mr. J. G. Anthony, of Cincinnati, U. S., has discovered that the *Unios* spin a byssus, which fact had hitherto escaped collectors. The location was a very curious one—a strong rapid current running over a gravelly bottom: in such exposed situations, *Unios* do not often attempt a lodgment, but prefer sandy bars or muddy shores, where the water is not very deep or rapid. Upon these gravel beds, however, the large shells are imbedded, and the young ones spin the byssus by which they attach themselves to the larger shells, or the stones of the ground. In this way, hundreds may be seen moored and riding securely at anchor at the utmost tension of their lines. The thread appears to be attached to the mantle, is probably produced by it, and is not an umbilical attachment.

This account Mr. Gray considers curious: first, as showing the relations of these animals to the family of *Arcadæ*; secondly, as showing what Mr. Gray had long expected, from his observations on some marine gasteropodous mollusca,—that many, if not most of the kinds, have the power of forming a byssus when it can assist them in their habits. It is very desirable, however, that the place where the byssus is attached to the animal should be examined, for if it takes its origin from the mantle, it is an anomaly in the organization of mollusca. It always arises, as far as Mr. Gray is aware, from some part of the foot,

in general from the anterior part of the base, as in *Mytilus*, *Pinna*, *Avicula*, *Pecten*, &c., but sometimes from the end of this organ, as in *Arca*, from whence also Mr. Gray suspects it to arise in the Uniones. —*Annals and Mag. Nat. Hist.*, No. 34.

PRICES OF SHELLS.

Dr. Goodall's valuable collection of Shells were sold by auction on June 8—14. As it may interest our readers to know the Prices, we have noted a few of the principal lots from the Catalogue, and have appended the sums fetched:—The true umbilicated Nautilus and a singular distorted Fusus, 3*l.* 3*s.*—Crassatella tumida, from the coast of Columbia, very rich in colour and scarce, 2*l.* 12*s.* 6*d.*—A splendid specimen of the Conus Ammiralis, 2*l.* 2*s.*—A magnificent specimen of the Aspergillum vaginiferum, from the Red Sea, 11*l.* 11*s.*—Septaria arenaria, 38 inches long, 2*l.* 10*s.*—Trochus imperialis, from the South Seas, extremely rare and fine, 3*l.* 15*s.*—Harpa imperialis, rich in colour, 3*l.* 12*s.*—Helix mamilla, fine and scarce, 2*l.* 12*s.* 6*d.*—Chiton amiculatus, very rare, supposed to be the only one known in England, 8*l.* 10*s.* A magnificent specimen of the Scalaria pretiosa, 2*l.* 6*s.*—Cardita squammiferus, rare, 3*l.* 12*s.* 6*d.*—Fissurella clypeiformis, F. crenulata, and F. picta, 4*l.* 15*s.*—Trichotropis bicarinata, extremely fine and scarce, 5*l.* 5*s.* A very rare variety of the Achatina Sultana, 7*l.* 10*s.*—A splendid specimen of the Crassatella kingicola, 3*l.* 10*s.*—Eburna papillaris, scarce and fine, 7*l.* 15*s.*—A beautiful Spondylus spathuliferus, 3*l.* 5*s.* —A splendid specimen of the Conus cedo nulli, very rare, 4*l.* 10*s.*— A beautiful and richly-marked dark variety of the Conus nobilis, very scarce, 7*l.* 10*s.*—Achatina maculata (Swainson), from the South Seas, very rare, 5*l.* 10*s.*—Rostellaria rectirostris, fine and scarce, 4*l.* 15*s.*— A splendid specimen of that extremely rare shell, the Conus omaicus, 21*l.*—Lucina Childrenii, extremely fine and scarce, 10*l.* 10*s.*—A fine example of that very rare shell, the Voluta junonia, 14*l.* 14*s.*—A magnificent specimen of the Spondylus regius, 8*l.*—An extraordinarily fine specimen of the Solenimya Mediterranea, 3*l.* 15*s.*—Monoceros grandis, rare, 2*l.* 2*s.*—Hinnites corallinus, from the East of Africa, very rare, 5*l.* 5*s.*—Cancellaria nodulifera, scarce and fine, 2*l.* 12*s.* 6*d.*—A fine specimen of the Spondylus ducalis, 4*l.* 11*s.*—A beautiful Spondylus, 2*l.* 10*s.*—*Athenæum*, No. 659.

REGENERATION OF LOST ORGANS.

Sir J. G. Dalyell has presented to the British Association an interesting and important paper "On the Regeneration of Lost Organs by two Marine Animals, the *Holothuria* and *Amphitrite*." He describes the *Holothuria* to resemble a sausage or cucumber in shape, with ten beautiful red branches surrounding the mouth, and above 2000 suckers covering the body. The head of this animal, including the branches, mouth, throat, and intestines, are sometimes separated from the body; but the animal does not die—it lies at rest several months, when the whole lost parts are found to have grown again. This loss may happen more than once; yet the animal will become again entire,

and the new organs may be seen discharging the same functions as the old. Further, there is a certain species of *Holothuria*, which divides spontaneously through the middle; when each half becomes perfect and entire. A single specimen produces above 5000 eyes. Sir John describes the Amphitrite as of a serpentine form, a foot in length; the head consisting of eighty fleshy feathers, disposed as a funnel or shuttlecock, three inches deep. This creature dwells in a black tube of its own construction, in which the observer can induce it to work. Every fleshy feather consists of 500 hairs, bordering the shaft: these collect invisible materials suspended in the water, unite them with glue from the mouth, and plaster them on the tube, smoothing them down with two trowels provided by Nature on the body. In this work, 40,000 instruments are employed at once. If this industrious creature loses its head, a new head will grow. Nay, if a fragment sunder from the extremity of its serpentine body, the same singularly-feathered apparatus will be generated to perfect the fragment. The elements of a new head reside in different parts of the body: of two sections from the lower extremity, each generates a head, so that, besides the original plume or head of the entire animal, two new plumes on the separated parts exist—all three at once!—*Literary Gazette*, No. 1237.

NEW AND RARE INSECTS.

On May 4, Mr. Newport exhibited to the Entomological Society, a specimen of the pupa of *Sphinx ligustri*, which he had purposely rendered monstrous by preventing the development of the tongue case. Mr. Yarrell exhibited larvæ of *Tipula oleracea*, which at that time were destroying the grass in the squares of London; and Mr. Hope stated that lime-water, and water from gas manufactories, were serviceable in the destruction of the insects. Mr. Hope also exhibited a new species of walking-leaf insect from the Neilgherries, brought home by Mr. Robertson, by whose name he proposed that it should be designated.

On June 1, various new and interesting Insects were exhibited, particularly a new and very distinct British genus of *Carabidæ*, by Mr. S. Stevens; the nest of an *Oiketicus*, from the East Indies, by Mr. Saunders; and a mass of the cocoons of a small *Ichneumon*, by Mr. Ingpen. Mr. F. Smith exhibited a series of species of the complex genus *Andrena*, of several of which he had discovered the sexes, which were very distinct, and had led to mistakes in the works upon the bees. Mr. Westwood also exhibited a specimen of *Myrmecocystus Mexicanus*, a Mexican ant, three of the neuters of which have the body immensely swollen, and are stated never to leave the nest, but there secrete a kind of honey; whilst the common neuters are of the ordinary form: accompanying this exhibition with observations on the diversity in the development of the females and neuters amongst hymenopterous insects; such as the different kinds of neuter hive-bees described by Huber, &c.

On July 6, Mr. Hope exhibited a collection of splendid *Coleoptera* from Mexico; and Mr. Raddon some fine insects from the African

Gold Coast, as well as two new British species of moths. Mr. Marshall mentioned a remarkable peculiarity, observed by Mr. Doubleday, in the *Sesia bombyliiformis*, which, on first emerging from the pupa, has the transparent part of its wings entirely clothed with scales.—*Literary Gazette*, No. 1229.

BOOKWORMS.

On June 22, the Keeper of the Ashmolean Museum, at Oxford, described to the Society, the following animals found in paper, leather, and parchment; and popularly known as "Bookworms." Such are the *Anobium*, the *Dermestes*, and *Lepisma Squamatum*, *Argenteum*, *Caudâ triplici*. The larvæ of *Crambus pinguinalis* will establish themselves upon the binding of a book, and spinning a robe, which they cover with their own excrement, will do to it little or no injury. A mite, *(Acarus eruditus,)* eats the paste that fastens the paper over the edges of the binding, and so loosens it. The caterpillar of another little moth takes its station in damp old books, between the leaves, and there commits great ravages. The little boring wood-beetle, *(Anobium pertinax*, and *striatum,)* also attacks books, and will even bore through several volumes. M. Peignot mentions an instance where, in a public library but little frequented, twenty-seven folio volumes were perforated, in a straight line, by the same insect, (probably one of these species,) in such a manner, that, in passing a cord through the perfect round hole made by it, these twenty-seven volumes could be raised at once. The animals last mentioned also destroy prints and drawings, whether framed or kept in a portfolio. The *Termes pulsatorius*, which frightens the timid at night, as the death-watch, is also accused of being a depredator of books.—*Oxford Herald: abridged.*

NEW WAX.

M. Stanislas Jullien has exhibited to the Academy of Sciences, at Paris, some specimens of Wax made in China, by a species of small insect not at all related to the bee, and which is commonly found upon two peculiar kinds of plants there.

SILKWORMS IN FRANCE.

The rearing of Silk-worms in France is progressing with promise. M. de Gasparin, in a memoir submitted to the Academy of Sciences, states his belief that the various conditions of heat, soil, light, &c., being ascertained, the mulberry may be acclimated in the neighbourhood of Paris, especially since it has been successfully attempted still further north. It is not the great cold of winter that does harm to this plant, since it can support a maximum cold of—25 of the Centigrade scale, but rather the hoar-frosts that are liable to attack it at the moment of its foliation. The relative advantages of the climate of the south of France and that of Paris, in these respects, may thus be calculated according to the different circumstances of the atmosphere:—

	At Orange.		At Paris.
Heat.....	100	.....	64
Light	100	.....	87
Hoar-frost.....	81	.....	100
Rain.....	100	.....	62
	381		313

Hence, the relative advantages are as 38 to 31, nearly. Moisture is necessary to the good growth of the tree, and light especially so. A tree planted in a sunshiny climate has a rounder form, and the leaves are not so long, and are more firm, than those of one planted in a district where the sky is often cloudy. It is known that the leaves of the mulberry-tree grown in shady situations are not so nutritious as those of a tree which has enjoyed much light. The workmen commonly state, that leaves of the former kind give the silkworms the dropsy; and M. de Gasparin, on drying two such sorts of leaves, and then subjecting them to certain processes, has found that those of the former kind retain of solid matter only 27 per cent., whereas the latter have 58 per cent.: the difference of light, therefore, produces a difference of 2 to 1 in the value of the leaf for economical purposes. Such has been the success of rearing Silkworms in France, that in 43 departments, the annual value of the products was 42,000,000 francs.—*Literary Gazette*, No. 1210.

M. Bonafons has likewise communicated to the French Academy, that the Chinese practice of sprinkling rice-flour upon Silkworms led him to ascertain whether by colouring the flour with madder, indigo, or other innocuous dyes, he could give a colour to the produce of the worm. The result has proved satisfactory; and cocoons, thus tinted, have been submitted to the Academy.

RARE ZOOPHYTES.

Mr. W. C. Trevelyan has lately picked up on the beach at Brodick, in Arran, a specimen of the beautiful *Goniaster Templetoni*, and of the *Luidia fragilissina* of Forbes, in the *Wernerian Transactions*. Mr. Trevelyan has also found numerous specimens of the very beautiful and curious *Actinia maculata* of Johnston's *British Zoophytes*, and always accompanied by the hermit crab, inhabiting the shell and the horny extension of it, to which the Actinia is attached. —*Jameson's Journal*, No. 58.

NEW PODURA.

Prof. Agassiz has read to the British Association an account of an insect of the *Podura* tribe, which he has discovered in great numbers inhabiting crevices in the ice of the glaciers of the Alps, and which are supposed to feed on the animalcules which abound in the ice.

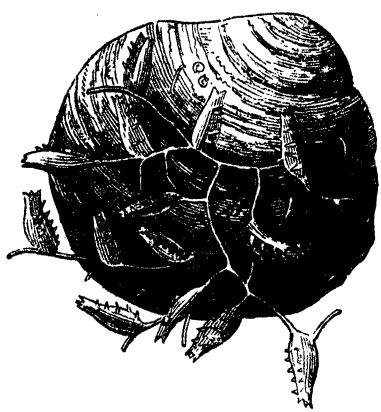
THE ANIMAL OF HYRIA.

The mantle lobes of the species of this genus, brought from British

Guiana, by Mr. Schomburgk, are united together behind, and furnished with two short separate contractile siphons, like the animals of *Iridina* and *Leila*, though the submarginal impression of the shell does not show indications of any inflation behind.—*J. E. Gray; Annals*, and *Mag. Nat. Hist.*, No. 37.

NEW ZOOPHYTE.

Dr. George Johnston has described in the *Annals of Natural History*, No. 31, a remarkable and eccentric new genus of British Zoophyte; which he has named *Beania*, from its having been sent to the Doctor by Mr. W. Bean, of Scarborough, where it is very rare. The only specimen which Dr. Johnston has seen of this very remarkable coralline is parasitical on the upper valve of an *Anomia Ephippium*, that is likewise almost crusted over with two or three species of *Lepralia*. It may be easily seen with the naked eye, but is of such minuteness that it may be readily passed over unnoticed, excepting by a naturalist of the practice and acuteness of its discoverer. The stalk creeps over the surface of the shell, to which it adheres loosely, and is divided at intervals without order or regularity, the shoots sometimes forming a long simple thread, while at other places, they anastomose freely. The shoots are very slender, filiform, smooth, colourless, and pellucid, tubular, unjointed, and horny; and in general, they are slightly swollen at the origins of the cells. These appear to be rather seated on a tube than a development of it, though probably, there is a direct and free communication between them. The cells are scattered, and always single, half a line in height, sessile, ovate, bulging below, horny, vesicular, slightly compressed, smooth, with a double keel down one side, each keel armed with from five to seven spinous teeth, placed sometimes nearly opposite, and in other instances alternating. The aperture is quadrangular, terminal, and wide; half closed with a thin membrane, and furnished at each angle with a spinous denticle.



(Beania mirabilis.)

Though the polypes are unknown, yet, from the structure of the polypidom, there can be little hesitation in prognosticating their affinity to those of the family *Vesiculariadæ*.

The engraving shows *Beania mirabilis*, as it appears on one part of the shell, considerably magnified.—*Annals Nat. Hist.*, No. 31.

ASCIDIANS.

MM. FORBES and GOODSIR have communicated to the British Association their discovery of two species of Ascidians in the water of the Frith of Forth, which, upon dissection, proved to be related to the Tunicata, and of interesting character. The animals of this genus are—*free, elongated, dilated posteriorly, respiratory and excretory orifices exserted, the first being at the anterior extremity, and in the axis of the animal.* As both the species were found in muddy ground, the genus was named *Pelonaia.* External and internal symmetry is the leading peculiarity of *Pelonaia.* It is this symmetry which renders the genus valuable, as it reveals the structure and relations of the different organs in the unsymmetrical ascidians. We may now state with certainty that the branchial vein, heart, and systemic artery of the typical ascidians correspond to the dorsal vascular system of the annulose animals, and the systemic veins and branchial artery to the ventral vascular system in some of the latter. The genus is also interesting, as it indicates the relations of the Mollusca to the Annulosa, and to the Echinodermata.—*Athenæum*, No. 678.

ECONOMY OF THE BACILLARIÆ AND CLOSTERINÆ.

ON March 18, a paper was read to the Microscopical Society, by Mr. Edwards, "On the Structure and Affinities of the Bacillariæ of Ehrenberg." After commenting on the polygastric characters of these animalcules, the indestructible nature of their siliceous coverings, and their mode of reproduction by spontaneous division, the author proceeds to discuss the merits of those views, which have claimed for the Bacillariæ, on one hand, a place in the vegetable, and, on the other hand, a position in the animal, kingdom. The mixed nature of the phenomena exhibited by these animalcules, which has led some naturalists to consider them as in one stage of their existence animals, and in another vegetables, furnishes, according to the author, sufficient grounds for considering the Bacillariæ as an osculent group uniting the two great kingdoms of nature.—*Athenæum*, No. 649.

On May 20, Mr. Dalrymple read to the above Society a paper on the family of Closterinæ, which have been classed by Ehrenberg among the Polygastric Infusoria, and by Meyen with Confervæ. The author described at length the general characters and structure of closterium, the peculiarities of its circulation, and the motion of the active molecules within the shell, and the several modes of reproduction by spontaneous transverse division, by ova, and by interbudding or the conjugation of two individuals; and concluded by advancing arguments in favour of the Closterinæ being retained to the animal kingdom.—*Athenæum*, No. 658.

DIGESTIVE ORGANS OF THE INFUSORIA.

M. MEYEN, in an interesting paper on this subject, asks: "What is the nature of those vesicular cavities, of such great numbers, and so variable in size, which appear in the interior of the Infusoria?" They

are not stomachs: they possess nothing in common with the balls which have also been taken for stomachs, although the latter may accidentally get into them singly. We may trace the formation of these cavities, and perceive their sudden and complete disappearance, with as much ease as the formation of the balls. Nay more, it is sometimes possible to see how one of these cavities moulds itself over a ball, and speedily afterwards disappears. The microscope shows that these cavities are not lined with a particular membrane, but are mere excavations of the pulpy substance. They likewise often appear very near the inner surface of the membrane which forms the skin of the animal, and some of them increase to such a size that their diameter is equal to the third or the half of the entire cavity of the Infusoria. The slight refraction which the rays of light undergo at their circumference, proves that their cavities are not filled with air, but by a liquid; and in the large infusoria, it is easy to satisfy ourselves that they do not open on the exterior. Similar cavities are found in the unicus of true cellular plants, particularly in certain aquatic Cryptogamia.

These researches, adds M. Meyen, require a great degree of perseverance, for it is not easy to establish these facts in all Infusoria; but they are of high importance, since the order Polygastria has already been admitted into many modern treatises on Zoology.—*Selected from Jameson's Journal*, No. 56.

ANIMALCULES IN CHALK.

M. DE HUMBOLDT has stated to the Academy of Sciences, at Paris, that in certain cretaceous formations in Prussia, it has been ascertained that $\frac{12}{20}$ths of the mass of the rock consist of very small Coralliform Polythalmic Insects and Infusoria, out of which three-fourths are identical with the species now living on the shores of the Baltic.

MICROSCOPIC ANIMALCULES.

ON April 22, Dr. Lindley communicated to the Microscopical Society some observations on the antheridia of *Polytrichum*, in the cells of which are contained microscopic animalcules of the genus *Vibrio*. This discovery, made by Unger, in reference to the antheridia of *Sphagnum*, and afterwards by Meyen, has been confirmed by the observations of Dr. Lindley, who gives the following description:—

The antheridia contain a cellular mucous substratum of great transparency, and in each of the cells has one coiled-up *Vibrio*, which turns round and round within the cell with such rapidity, that it resembles a cyst in very active motion, the dark head of the *Vibrio* forming an eccentric point, round which the rotatory motion takes place. As soon, however, as the *Vibrio* gets into the water, its tail becomes straightened, and then the true nature of the moving body becomes apparent.—*Annals Nat. Hist.* No. 31.

MEADOW LEATHER.

M. DE HUMBOLDT has submitted to the Academy of Sciences, at Paris, some specimens of a curious substance like fine felt, collected on

marshes in Silesia, near Sobor, where the inundations of the Oder prevailed in the previous year. This substance had become whitened by the air and sun, and proved to be the exuviæ of about fifteen various kinds of Infusoria, characterized by M. Ehrenberg*.

MEADOW LEATHER IN ENGLAND.

On June 8, there was sent to the President of the Royal Society, by H. R. H. Prince Albert, F.R.S., a specimen of a deposit with which nine acres of land near Exeter, belonging to Lord Radnor, had been covered after the subsidence of a flood. Dr. Lindley, on examination, found this to be the *Conferva crispa* of Dillwyn, which is said to be the *Conferva fluviatilis* of Linnæus. The species inhabits fresh water, and multiplies with great rapidity, forming entangled strata. The green portion is the *Conferva* in its young state; the white portion is the plant old and bleached. The whole mass consists of articulated filaments, among which are fragments of grass leaves. In the neighbourhood where it was found, poor persons are said to have made waistcoats of it. We have named it Meadow Leather from its resemblance to the vegetable production so called, which was found at Schwartzenberg in 1839.

RED SNOW.

Prof Agassiz has made a communication to the British Association, "On Animals found in Red Snow." He stated, that our countryman, Shuttleworth, has lately demonstrated that besides the *Protococcus nivalis*, the Red Snow contains several species of Infusoria. He concludes, that the Red Snow is altogether an animal production, and that the so-called *Protococcus nivalis* is the ova of a species of rotiferous animal, called by Ehrenberg, *Philodina roseola*. This animalcule he has found dead in the Red Snow, and occurring abundantly in ditches in the neighbourhood, at the bottom of which its ova produced a red deposit. Under the microscope, the coloured ova in the ovaries could be distinctly seen.

Dr. G. W. Arnott believes that more than one species of Protococcus, and perhaps other genera, produce the Red Snow, as that brought by Capt. Parry from the Pole was very different from that which occurs on the Alps and the mountains of Scotland: it may be animal in one district and vegetable in another. Prof. Agassiz has mostly found the lower forms of plants in connexion with animals, and *vice versâ*; and it is probably a question for further investigation, whether there is not a vegetable matter existing which is the source of nutriment to animals in the Red Snow. Mr. Forbes observes, that if the Protococcus in one place is of animal origin, the inference must be drawn that all that tribe of so-called plants have the same origin.

* See a Notice of a similar substance, found at Schwartzenberg, in 1839, in Year-Book of Facts, 1840, p. 179.

Mr. Shuttleworth's paper, referred to above, and translated from *La Bibliothèque Universelle* de Genève, No. 50, will be found in *Jameson's Journal*, No. 57. It consists of an elaborate investigation with a microscope, magnifying 300 diameters, of the various organized substances which form Red Snow. The paper extends to ten pages, and is illustrated with a coloured plate.

RED COLOUR OF SALT MARSHES.

On Feb. 24, M. Marcel de Serres contributed to the Academy of Sciences, at Paris, a paper from Prof. Joly, of Montpellier, on the presence of Infusoria in Salt Marshes, giving the water a Red Colour: he has named this insect *Monas Dunallii;* but it had hitherto been set down as the *Artemia Salina.* Prof. Joly suggests that the red colour of certain strata of Rock Salt may be caused by the presence of infusoria of this kind; and having dissolved some salt, and examined it with a microscope, he has found it leave small red particles similar to those in salt marshes.—*Literary Gazette*, No. 1207. *(See page* 110.*)*

LOWEST ORGANIZED BEINGS.

On March 20, was read to the Botanical Society, a paper "On the Nature of the Lowest Organized Beings," by Dr. W. H. Willshire. The views of Ehrenberg, lately advanced in his work "Die Infusions Thiercen," were questioned in regard to several of the *Bacillariæ*, *Closterinæ*, and others; and Dr. Willshire doubted the animal organization of the subdivision *Naviculaceæ*. Self-division is not confined to the animal, but to be observed also in the vegetable, kingdom; therefore, this mode of propagation in such structures as *Diatoma*, *Fragillaria*, *Desmidium*, &c. is not sufficient proof of their animal condition. Besides the granular matter seen within many of these lower beings, regarded by Ehrenberg, in many cases, as ova granules, or eggs, cannot be such; as Meyen has observed, in *Enastrum* and *Closterium* more particularly, they become blue by the action of tincture of iodine; and this fact Dr. Willshire considers an evidence of their vegetable nature. Further, the faculty of locomotion, the author contends, is no proof of animal condition; because the sporules of several *algæ*, when ripe, possess this power; and it occurs in structures acknowledged by Ehrenberg himself to belong to the vegetable kingdom, namely, *Oscillatoria*, *Zygnoma*, &c. Finally, in the present state of knowledge, the attainment of a particular result from the occurrences of motion, (more apparent in *Navicula* than *Oscillatoria,*) cannot be proof of animal condition, because the movements of *Zygnoma*, *Vallisneria*, and the motion of many irritable stamens, equally exhibit the like attainment. Hence, Dr. Willshire infers the probability of many of the almost invisible organisms, hitherto yielded by the botanist to the zoologist, not possessing sufficient claim to such high distinction; although they may not so decidedly evince vegetable nature as do *Diatoma*, *Fragillaria*, *Desmidium*, *Closterium*, and others.—*Literary* [illegible] No. 1218.

BOTANY.

EXTRAORDINARY VITALITY OF SEEDS.

Sir Gardiner Wilkinson, during his recent travels in the Thebaid, opened an ancient tomb, (which, probably, had remained unvisited by man during the greater part of 3,000 years,) and from some alabaster sepulchral vases therein, took a quantity of wheat and barley that had been there preserved. Portions of this grain, Sir G. Wilkinson presented to several of his antiquarian friends, and among them to Mr. Pettigrew, who, in the year 1838, gave six grains of the wheat, and as many of the barley, to Mr. M. F. Tupper, of Albury, near Guildford. Until the spring of 1840, these twelve corns remained among certain contemporary bronzes and images in their separate paper box; but, about that time Mr. Tupper resolved to try to rear the seeds. He first procured four garden-pots of well-sifted loam, which he passed, morsel by morsel, between his own fingers, so that it is next to impossible that any other seed could have been there. On March 7, 1840, Mr. Tupper planted his twelve grains, three in each pot, at the angles of an equilateral triangle, so as to be sure of the spots where the sprouts would probably come up, by way of additional security against any chance seed lurking in the soil. Of the twelve, one only germinated, the blade first becoming visible on the 22nd of April; the remaining eleven being picked out again by Mr. Tupper, who found them, in each instance, rotting in the earth, and being eaten away by a number of minute white worms. (It is a curious speculation whether this might not have been a renewal of dormant animal life; for it is by no means improbable that the little maggots, on which we might build such high argument, were the produce of ova deposited on the grains, at a period involving the very youth of time, by some patriarchal flies of ancient Egypt.)

Mr. Tupper's plant of wheat remained in the atmosphere of his usual sitting-room until change of place and air seemed necessary for its health, when it was transplanted to an open flower-bed, where it has flourished ever since. The first ear began to be developed on July 5; its appearance is, in most respects, similar to that of a rather weakly plant of English wheat—that called by farmers "bearded," which is sometimes known by the name of Egyptian. A sound ear has made its appearance, and both have assumed a character somewhat different from all our known varieties. The slight differences observable are, that the ears are less compact, the grains rather plumper, and the beards more thornlike than happens in common cases. The small size and weakness of the plant may, in one light, be regarded as collateral evidence of its great age; for assuredly the energies of life would be but sluggish after having slept so long: however, the season

of sowing it, spring instead of autumn, will furnish another sufficient cause; but, after making due allowance for this drawback, Mr. Tupper thinks it very improbable that, supposing the plant a modern one, the rich soil of Albury should have produced so lightly. There are two ears on separate stalks; they are respectively 2½ and 3 inches long, the former being much blighted; and the stalk is about 3 feet in height.

Mr. Tupper sees no reason to disbelieve this plant of wheat, now fully developed, to be indeed the product of a grain preserved since the time of the Pharaohs,—that we moderns may, within a little year, eat bread made of corn which Joseph might have reasonably thought to store in his granaries, and almost literally snatch a meal from the kneading-troughs of departing Israel.—*Times, Oct.* 9, *abd.*

PLANTS AND ANIMALS IN SULPHUREOUS SPRINGS.

Dr. Lankester has read to the British Association an account of Plants and Animals found in the Sulphureous Springs of Askern and Harrowgate, Yorkshire; in which a species of *Conferva* abounds, which in its structure resembles a species of *Oscillatoria*: it collects in large quantities around the sides of the wells, and, with deposits of inorganic and animal matters, forms layers of a dark green, white, and rose colour. In decomposing, these plants give out a more powerful odour than the water itself, a circumstance which has given rise to the opinion that a sulphuret of azote exists in these waters. These plants are peculiar to sulphureous waters, and probably have their existence determined by the sulphuretted hydrogen they contain. Throughout a large district in the neighbourhood of Askern, springs of water rise impregnated with sulphuretted hydrogen, and the soil around becomes saturated with it. In places where water runs over or collects on this soil, deposits are frequently seen, varying from a light pink to a beautiful rose and carmine colour. These deposits rapidly appear and disappear, and have been found by the author to depend on the presence of two species of animalcules. One is oblong, with from two to ten stomachs, about the one-thousandth of an inch long, and with rapid movements; the other is much longer, having about the same number of stomachs, and in its motions and shape very much resembles a *Vibrio*. The first resembles the *Astasia hæmatodes* of Ehrenberg, but it does not possess a tail, which is a characteristic of the genus *Astasia*. This animalcule was found, by Ehrenberg, forming a blood-coloured sediment in a lake on the Steppe of Platow, in Siberia. These animalcules live in water artificially impregnated with sulphuretted hydrogen: they have never been seen in any place where sulphuretted hydrogen did not exist, and in many instances the author has been able to detect this gas by their presence, in places where he did not suspect its existence. Dr. G. W. Arnott believes, from the drawings of the plants, that the first was the *Conferva nivea* of Dillwyn; the second, supposed by Dr. Lankester to be an Oscillatoria, does not, he thinks, belong to that genus. The existence of such plants is a curious phenomenon.—*Athenæum*, No. 674; *abd.*

POLLEN AND VEGETABLE IMPREGNATION.

Dr. Aldridge, of Dublin, having discovered that nitric and other inorganic and organic acids produce the dehiscence of pollen grains, in the same manner as if placed on the natural stigmatic surface, has instituted a number of Experiments, the general results of which he has presented to the British Association. He concludes: 1. The stigma is invariably acid. 2. It is in consequence of this acidity that the pollen bursts. 3. That by the same means the fluid contents of pollen become coagulated, enveloping the fovilla, and assuming, according to the method of dehiscence, different and very remarkable forms. In explanation of the means by which the fertilizing influence of the male organs is communicated to the ovale, the author concludes that the *boyau*, or intestine-like protrusion from the pollen grains, is the result of the action of acids upon the fluid which contained the fovilla in the pollen grain; and he infers this from the fact of this tube, or *boyau*, never being formed when the pollen grain is placed in water, but being constant when the grain is placed in acid. Dr. Balfour states it has been observed, in some cases, that the pollen was alkaline; if this be correct, it is remarkable, taken in connexion with the acidity of the stigma. Prof. Link, of Berlin, thinks Dr. Aldridge correct as to the nature of the *boyau*; he believes it to be formed of a glutinous matter, like that of which the spider makes its web.

CROPS AND SOIL.

On June 15, M. Boussingault read to the Academy of Sciences, at Paris, a memoir on the proper Succession of Crops to be observed in agricultural operations; and on the nature and quantity of the residuum left in the soil by various kinds of crops. He laid it down, as the result of observations hitherto made, (and which are still to be conducted for a series of years,) that any given crop influences a succeeding one; not merely by the quantity of vegetable and azotic matter left behind by it in the soil, but also by the circumstance whether the plant forming the crop had penetrated deep into, and had exhausted, the soil or not. Thus, wheat is found to grow much better after potatoes than after beet-root; and far better after clover than after either of the other two crops. The usual succession in the east of France he stated to be potatoes, beet-root, wheat, clover, and oats; but this is, no doubt, a faulty system.—*Literary Gazette*, No. 1223.

TIMBER AND SOIL.

In the Proceedings of the Academy of Sciences, at Paris, the nature of the Soil on which Timber grows has been shown to be of great influence on the timber itself. Thus, the ashes made by timber from the Jura, growing on what is called Jurassic limestone, are found to contain a considerable proportion of earthy carbonates, sometimes from 30 to 40 per cent. of their weight, with only from 2 to 3 per cent. of siliceous substances; whereas, the ashes of the same kind of timber grown on gravelly or sandy soils in Switzerland, and especially on the Vosgian sandstones, contain much more of siliceous matter

than earthy carbonates. If osiers also, for the purposes of basket-making, &c. are steeped in water containing metallic salts in solution, they become exceedingly brittle; whereas, if steeped in water containing alumine, they retain their elastic properties.

NEW VEGETABLE TISSUES.

On April 22, Mr. Bowerbank described to the Microscopical Society, four new forms of Vegetable Tissue, occurring in silicified wood from Antigua, &c. The three first are from Dicotyledonous woods, and present some interesting varieties of reticulated vascular tissue. In one example, the thread of the net-work is filled with numerous vesicular cavities, not exceeding the $\frac{1}{18000}$th of an inch in diameter; and in a second the interstices appear to contain the remains of discoid organs like those seen in the vessels of Ephedra, to which genus the author thinks the fossil may be referred. The fourth is from a silicified palm, and consists of numerous minute globules, which, when viewed through a power of 800 linear, are seen to constitute very beautiful fibro-vesicular tissue, having a broad and gibbous thread with irregular interspaces.—*Ann. Nat. Hist.* No. 31.

GROWTH AND PRUNING OF FOREST TREES.

On July 28, Mr. G. Thurtell read to the Royal Botanic Society a paper upon the Growth and Pruning of Forest Trees, which was clearly illustrated by numerous specimens brought from Holkham, the seat of the Earl of Leicester, showing the advantages of natural over artificial pruning. Mr. Thurtell deprecated the use of close-pruning, instancing from the specimens he exhibited, that where the excision is made, decay inevitably takes place; and that while Nature conceals the wound by forming fresh wood over it, the unsound portion, about to become the nucleus of future dissolution, is enclosed within the body of the tree: and thus, that which has the outward appearance of firm and healthy timber, may be in such a state of rottenness in the interior as to be incapable of supporting any ordinary weight. This was proved in a communication which he had received from the late Lord Suffield, who mentioned that in some buildings he had erected the rafters had fallen in: here the inside of the wood was rotten, the marks of the saw being distinctly visible within the sound outside, plainly proving close-pruning to have been used. By natural pruning, Mr. Thurtell explained that when the lower branches of a tree had performed the duties assigned to them, they died off; the tree thus, it may be said, pruning itself. And, contrary to the effects of close-pruning, in this case no decayed wood is imbedded in the new formation of timber, but all is healthy and sound. In conclusion, Mr. Thurtell called the attention of the proprietors of woods and forests to a subject fraught with so much importance to the landed interest and our national wealth.—*Literary Gazette*, No. 1228.

MODE OF PRESERVING

M. St. Aubin recommends for this purpose, to form with clay a

mass similar in size and shape to the fruit to be preserved. This mass is then to be surrounded with a thin coating of wax, and when the latter has cooled, it is to be cut in half, so as to obtain two hollow hemispheres. The fruit is then to be inclosed in the latter, which are to be cemented together with fresh wax.—*Athenæum*, No. 666.

PRESERVATION OF BOTANICAL SPECIMENS.

At a late meeting of the Botanical Society of Edinburgh, Professor Christison presented some observations on the preservation of fruits and other botanical specimens in a moist state; and remarked, that after numerous experiments, made for a series of years, with various fluids, he had found none which served so well to preserve both the consistence and colour of fruits, leaves, and flowers, as a concentrated solution of common salt. Numerous specimens were exhibited, which had been preserved, in this way, for one, two, three, and five years; among which were sprigs with leaves and ripe and unripe fruit of *Myristicha moschata*, *Xanthechymus pictorius*, *Garcinia Cambogia*, *G. Mangostana*, *Alpinia Cardamomum*, *Mangifera Indica*, *Ricinus communis*, &c. In the greater part of these, the green tint of the leaves, and the colour of the fruit, had undergone little alteration. When the fruit, however, is very pulpy, as in *Solanum Lycopersicum*, or lemons and oranges, a solution of salt causes the specimens to shrivel by exosmosis of its fluids; and diluted pyroligneous acid is found to be preferable. —*Gardener's Journal.*

TEA PLANT IN BRAZIL.

The Tea-plant was imported from China into the Brazils about twenty years ago, and is cultivated very extensively in some parts, particularly near St. Paul, about eighty leagues from the capital. One proprietor possesses 60,000 feet of tea-plants, some of which are six or eight years old. The tea is commonly gathered between October and February; and a good workman can collect nearly sixteen pounds per day. The youngest leaves form the "imperial" tea, and the less tender, "hyson" and other varieties. In the *Jardin des Plantes*, at Paris, have recently been placed 1,500 feet of tea-plants; and their importer, M. Guillemin, considers that certain parts of France, from their analogy to the Brazils in climate and soil, are well fitted for the cultivation of the plant.—*Observer.*

CULTURE OF THE VINE IN BRITAIN.

Such writers as have taken up the manufacture of wine in Britain, have considered it to have been, in past ages, a wine-growing country; and, reasoning upon this statement, they proceed to describe the little attention now paid to British wines as a neglect of our national resources. There is, however, on the one hand, no sufficient testimony in favour of the growth of wine on a large scale in ancient times, but on the other hand, some direct testimony against it.

The first positive authority for the Cultivation of the Vine in Britain

is Bede, who says: "Vineas etiam quibusdam in locis germinans*." It is important here to observe the "quibusdam in locis." Setting aside vague traditions, the next authentic testimony is that of Domesday Book, which mentions vineyards in several places. At Rayleigh, in Essex, we are told: "there is one park, and six arpennis, of vineyard, which, if it takes well, yields twenty modii of wine." *(Camden, Essex.)* But the very indication of a few vineyards here and there excludes the idea of any extensive cultivation, such as takes place in really wine-growing countries. At a subsequent period, many authorities, (for which see the *Archæologia*, vol. ii. chap. 2, and Miller's *Gardener's Dictionary*, art. *Vitis*,) prove the existence of vineyards in particular spots, and generally in connexion with cathedrals or religious houses. What was the success of these attempts of the monks to make wine, "in commodum et magnum honorem," as an old writer says, of their respective houses, may partly be conjectured from the accounts of a vineyard at Ely, given by Miller, where the sale of verjuice forms a considerable portion of the profits of the vineyard†. Only one passage has been quoted that would at all seem to imply an extensive cultivation of the vine in ancient times, and even in that, (from William of Malmesbury boasting of the superiority of the vineyards of Gloucestershire,) the terms are too vague to allow of any positive conclusion.

The belief in the extensive growth of the grape for the purpose of making wine has, therefore, no other authority than the existence of vineyards in a few localities. Plot‡ tells us, that in the year 1685, Dr. Bathurst, President of Trinity College, made as good claret at Oxford, "in a very mean year for that purpose," as any one could wish to drink; and Pepys says, that in the reign of Charles II., very good wine was made at Walthamstow. Miller gives a list of places at which wine was made in the course of the last century; among which are Rotherhithe, Brompton, Kensington, Hammersmith, Walham Green, (wine was made at this place for thirty years,) Arundel, and Pain's Hill, near Cobham. The wines of many of these places are described as being equal, or superior, to the French wines of the second class. That made by Mr. Hamilton at Pain's Hill, is said to have been fully equal to the best champagne, and to have sold for fifty guineas a hogshead.

The testimony against the growth of wine on a large scale in ancient times, rests on Petrarch, who, according to Miller, speaks of the people in England as not drinking wine; and Daines Barrington has quoted Lord Bacon, who says that grapes require a south wall to ripen.

All the testimony adduced merely indicates a very local and partial

* Hist. Ecclesiast., i. 1. The supposition of Daines Barrington, that in this and other passages, "Vineæ" refers to orchards of apple-trees and currant-gardens, is too improbable and unsupported to deserve serious refutation.

† In the 12th Edward II., the wine from the vineyards at Ely sold for £1. 12s.: the verjuice for £1. 7s. In 9th Edward IV., no wine, only verjuice was made. ‡ Camden, Staffordshire.

cultivation of the plant; such, in fact, as numerous experiments have shown to be practicable in recent times. These very interesting facts have been condensed from a paper in the *Philosophical Magazine*, No. 168.

THE DWARF PINE.

THERE are still botanists who regard the Dwarf Pine, (*Pinus Pumilio*,) as a mere form of *Pinus sylvestris*, produced by the elevated habitat. An experiment made with the ripe cones of each, however, tends to prove this view erroneous; for, both being planted on the northern part of the Lorbeerberg, near Charlottenbrunn, 1,800 feet above the level of the sea, in the year 1828, made their appearance in the second year; and, in 1839, while the *P. Pumilio* crept on the soil, and was one inch in diameter, the neighbouring specimens of *P. sylvestris*, which germinated at the same time, had attained a perpendicular height of 10 to 13 feet, with a diameter of from 2½ to 3½ feet. —*Linnæa, Pt.* 5; *Annals Nat. Hist.*, No. 29.

CRYSTALLINE MATTER IN CEDAR.

ON Feb. 18, Mr. Quekett remarked to the Linnæan Society, that on the recently cut surfaces of the wood of the Red Cedar, (*Juniperus virginiana*), a crystalline matter is observed to form, which puts on the appearance of a mouldiness, but which, when viewed with a magnifying-glass, is seen to consist of innumerable extremely minute crystals of an acicular form. The substance was observed to form on the duramen or heart-wood only, and not universally, but in patches. It is easily volatilized by heat, and gives out the well-known odour of the wood. Mr. Quekett showed the duramen of the red cedar to contain an abundance of a concrete volatile oil, on which the peculiar odour depends, and that the crystalline substance is a compound formed between the air and the oil; for when the latter was obtained from the wood, and exposed to the action of the air, it was soon also found to be covered with the same acicular crystals. This substance, which possesses many of the properties of benzoic acid, Mr. Quekett considers new, and he proposes for it the name of Cedarine.—*Annals Nat. Hist.*, No. 29.

NEW PITCHER-PLANT.

ON Feb. 4, Mr. G. Bentham described to the Linnæan Society "the *Heliamphora nutans*, a new Pitcher-plant from British Guiana;" discovered by Mr. Schomburgk, growing in a marshy savannah on the mountain of Roraima, at an elevation of above 6,000 feet above the level of the sea. It belongs to the *Sarraceniaceæ*, and constitutes a very distinct genus of that small but remarkable family of plants, and hitherto exclusively confined to the United States. The genus is principally distinguished from *Sarracenia* by the entire absence of petals, small apterous stigma, and trilocular ovarium. For the character of this new genus, see *Annals Nat. Hist.*, No. 27.

SINGULAR GALL.

On April 7, Dr. Farre exhibited to the Linnæan Society specimens of a singular form of Gall on the leaves of a species of Oak, from Mexico. The gall consists of an aggregation of hollow cylindrical tubes, nearly an inch in length, and furnished with a fringed orifice. The tubes are remarkable for their elegance and uniformity; their colour is white, suffused with red, especially towards the apex.

THE ERGOT.

On Jan. 20, Mr. F. Bauer read to the Linnæan Society some "Observations on the Ergot." The author had previously determined the Ergot to be a morbid condition of the seed; but he was unsuccessful in ascertaining the cause of the disease, which Messrs. Smith and Quekett have satisfactorily shown to be occasioned by a minute filamentous fungus, which Mr. Quekett has named *Ergotæa arbortifaciens**. Mr. Bauer has displayed the different stages of the growth of this fungus in several masterly drawings.

ALOE IN BLOOM.

In September, in the garden of the Marquis of Ailsa, at St. Margaret's, Isleworth, there was in bloom a splendid specimen of the American Aloe, (*Agave Americana Variegata*, Linn.); the flower-stem, which shot up from June 10 to Sept. 20, was upwards of 20 feet high, and bore about 2000 perfect and distinct flowers.

SENSITIVENESS OF THE LEAVES OF OXALIS.

Prof. de Brignoli & Prof. Morren have communicated to the *Bulletin* of the Royal Academy of Brussels some interesting Notes on the excitability and spontaneous movement of the Leaves in the Species of *Oxalis stricta*, accidentally observed by two of the pupils of the former in the botanical garden at Modena. This is not mentioned in the list of species designated by authors as *sensitive*; and Prof. de Brignoli found that it must be teased a long while, as its movements are much slower than those of the *Mimosa pigra*. The irritability of the *Oxalis sensitiva* was already known. The Professor believes heat to be the principal agent in this phenomenon, because even the *Hedysarum gyrans* slackens its movement in autumn and during winter, in hothouses. He thinks that all the species of *Oxalis* are susceptible of contraction when irritated; but as most of them are natives of the Cape of Good Hope, it is possible that they show no effects from concussion in our climate, whose greatest heat never equals that of Africa.

Prof. Morren subjoins several valuable Notes upon this newly observed phenomenon, which has led, in its turn, to the discovery of an analogy of structure between the leaves of the *Oxalideæ* and those of the *Mimoseæ*; an analogy which could hardly have been expected but which is fully proved by direct observation.

* For a notice of Mr. Quekett's Researches, see Year-Book of Facts, 1840 p. 222.

The moveableness of *Oxalis* is more singular, as M. De Candolle has not been able to modify the sleep of these plants, either by means of darkness or light; whence he concluded that the movements of sleep and awakening were connected with a periodical disposition of motion inherent in the plant.—(*Physiologie*, vol. ii. p. 861). We see, however, that a single blow makes the *leaflets when awake* take the posture of *sleeping leaflets*.—The details of this paper, (see *Annals Nat. Hist.*, No. 26,) are very interesting, though too numerous for quotation here.

DATURA FASTUOSA.

On Aug. 11, Dr. Arnold, of Jamaica, read to the Royal Botanic Society, a valuable paper upon a new property discovered by him in the *Datura fastuosa*: that its application to the eye is followed by an almost immediate dilatation of the pupil; and he considers that the extraordinary powers of this plant evince its adaptation as a substitute for the *Belladonna*, which is very rarely of uniform strength, particularly such as is imported into Jamaica.—*Literary Gazette*, No. 1230.

BOKHARA CLOVER.

Mr. W. Taylor, F.L.S. having obtained from Mr. Loudon a small parcel of seeds of the Bokhara Clover, (*Melilotus arborea*,) caused the same to be sown early in April, 1839. The plant proved to be triennial, and stood the winter well. On April 28, following, a part of the crop was cut down, the stems measuring 15 inches in height; and on May 28, from the same piece of ground, a second crop was obtained, which had reached the height of 16 inches; a third, on June 28, 17 inches; a fourth in July, 16 inches; a fifth in August, 15 inches; and a sixth in September, measuring 14 inches. According to Mr. Taylor's calculation, the Bokhara Clover would yield from 20 to 30 tons of green herbage per acre, and from 2 to 3 tons of strong fibre, which appears capable of being manufactured into cordage. The flowers are white, and very fragrant, and the plant does not differ specifically from the *Melilotus leucantha*, although regarded by De Candolle as a distinct species.—*Annals*, and *Mag. Nat. Hist.*, No. 37.

DATISCA CANNABINA.—IMPREGNATION.

Dr. Fresenius has observed that in *Datisca cannabina*, when female plants remain isolated, they are able, nevertheless, to produce ripe fruit in abundance; and he thinks he is justified in concluding that this and other purely female forms are, in the absence of male organs, endowed with the capability of developing, by a purely vegetative process, the highest vital product, the terminal bud. In the summer of 1837, a female specimen of the above plant in the Francfort Botanical Garden, developed a stem from its root, which now male flowers also.—*Linnæa*, Part iii.; *Annals Nat.*

GUINANESE BLOW-PIPES.

Mr. Schomburgk*, the enterprising traveller, has communicated to the Linnæan Society an interesting "Description of the Curata, a plant of the tribe of *Bambuseæ*, of the culm of which the Indians of Guiana prepare their Sarbacans, or Blow-pipes." Mr. Schomburgk found these reeds growing in dense tufts on the banks of a mountain stream, about 3,500 feet above an Indian village: they form, in general, clusters of from 40 to 100 stems, which are pushed forth, as in many other *Bambuseæ*, from a strong jointed subterranean root-stock. The stem rises straight from the rhizoma, without knot or interruption, and equally thick throughout, frequently to the height of 16 feet, before the first dissepiment is stretched across the interior, and the first branches are given off. The joints that follow succeed each other at intervals of from 15 to 18 inches; and the whole plant attains a height of from 40 to 50 feet. The stem, when full-grown, is at the base nearly 5 inches in circumference; but some stems at the height of 20 feet are scarcely a quarter of an inch thick, and offer no signs of articulation. The only ascertained localities of this plant were Mounts Mashiatti, Marawacca, and Wayana. — *Annals Nat. Hist.*, No. 27; *abridged.*

ASSAMESE TEA.

Good and sound Teas grown and manufactured in Assam have been imported during the year; and the culture is proceeding well†.

The East India Company are stated to have imported a considerable quantity of Assamese Tea: the black is reported to be good, but the green has a vile taste, from some failure in the *manufacture*, which, and not the growth, of the Tea Plant, is the main secret.

In the *Gardeners' Chronicle*, No. 1, the Chinese island, Chusan, which has been lately seized by the British troops, is stated to be the most northern station in which tea is made, and to abound with tea-trees, even to the tops of the mountains.

CEYLON MOSS.

On Jan. 8, there were presented to the Medico-Botanical Society some specimens of the *Fucus amylaceus*, with various moulds of jelly made from it, sent by Mr. Battley; who stated that his attention had been directed to an essay in the *Transactions of the Medico-Botanical Society*, on the subject of the Ceylon Moss, which it appeared had been introduced with great success into Calcutta as an article of importance in the sick chamber, and as affording a delicious nutriment to the mother during the suckling of her infant. It is a weed thrown

* "Mr. Schomburgk continues to explore with the same ardour. May this excellent young man, my countryman, always enjoy the kindness of your illustrious Society!"— *Letter of M. Von Humboldt, in the Transactions of the Geographical Society*, vol. ix. p. 50. Mr. Schomburgk's very interesting collection, "the Guiana Exhibition," described in the *Year-Book of Facts*, 1840, p. 191, has been sold, and, we believe, dispersed.

† For an abstract of Mr. Bruce's Second Report of the Growth and Manufacture of Tea in Assam, see Year-Book of Facts, 1840, pp. 228—233.

by the sea in great abundance on the coast of Java; it enters largely into the formation of the edible bird's-nest so highly prized in China, and it is also imported by the Chinese as a regular article of food. Dr. Sigmond said, from what he had seen and learnt of this moss, he anticipated the best results. Dr. Farre said, that he had witnessed at Mr. Battley's the mode of preparing the jellies; and in one respect this Fucus was superior to any thing of the kind; this was, the rapidity with which a jelly might be formed: in general some hours must elapse before it could be prepared, but in this instance in twenty minutes a delicate, well flavoured, and easily digested nutriment might be got ready.

THE DERBY ARBORETUM.

Mr. James Strutt has munificently presented to Trustees for the benefit of the public of Derby, an Arboretum, extending over nearly eleven acres of ground, which has been laid out by Mr. Loudon with great taste and judgment, both with reference to ornament and utility; and which will be worth, at least, £16,000. In order to unite, as much as possible, information with amusement, the walks comprise a valuable collection of trees and shrubs, so arranged and described, as to offer the means of instruction to visitors.

The first condition of the trust is—"That the Arboretum shall be open to all classes of the public without payment, and subject only to such restrictions and regulations as may be found necessary for the observance of order and decorum, on every Sunday, and also on at least one other day in every week, from sunrise to sunset:"—the Committee being at liberty to fix such terms of admission on the days not appropriated to the public as they may consider sufficient to keep the Arboretum in perfect order.

In presenting these Gardens to the public, Mr. Strutt admirably observes:—"As the sun has shone brightly on me through life, it would be ungrateful in me not to employ a portion of the fortune which I possess, in promoting the welfare of those amongst whom I live, and by whose industry I have been aided in its acquisition." This is true patriotism.

A minute description of this noble gift will be found in the *Gardener's Magazine*, 1840.

Geology and Physical Geography.

PROGRESS OF GEOLOGY.

AMONG the more important events in the Progress of Geology, adverted to by the President of the Geological Society, in his Aniversary Address, 1840, is the establishment of several Institutions in various parts of the country, from which is confidently anticipated great advantage, both to science and the arts.

1. The *Museum of Œconomic Geology*, established by Her Majesty's Government, in the Department of Woods and Forests, and Public Works, to be freely accessible to the public at stated periods. In this Museum, will be exhibited examples of Metallic Ores, Ornamental Marbles, Building Stones and Limestones, Granites, Porphyries, Slates, Clays, Marls, British-earths, and Minerals of every kind produced in this country, that are applicable to the arts of life. The establishment will also contain examples of the results of Metallurgic processes obtained from the furnace and laboratory, with a collection of Models of the most approved machinery, chiefly employed in Mining; and a well-stored Laboratory. A second department in the Œconomic Museum will be assigned to the promotion of improvements in Agriculture, and will contain sections of strata, with specimens of soils, subsoils, rocks, &c. A third department will be an office for the preservation of such records and documents relating to subterranean operations throughout the country, as are important to be preserved for the information of future generations.

2. The publication of a Report of the Commissioners of Woods and Forests, containing the results of an *Inquiry into the qualities and durability of the various Building-stones* of the country, with a view to the selection of the best material to be employed in erecting the New Houses of Parliament. (Extracts from this valuable document will be found in the *Year-book of Facts*, 1840, p. 78.)

3. The appointment of *a Geological Committee*, by the *English Agricultural Society*.

4. The establishment in the University of Durham of *Schools of Civil and Mining Engineering*, with lectures in the Mathematical Sciences, Chemistry, Metallurgy, Mineralogy, Geology, Surveying, Mapping, and Draining. At the University of London, and King's College, London, similar measures have been taken for candidates' certificates of proficiency in Civil Engineering, and the arts and sciences connected with Mining: at the latter establishment is a workshop and laboratory for the use of the students.

5. The establishment of *a School of Mining, in Cornwall*, which, with the Schcol in the University of Durham, form almost solitary examples in England, of such scientific institutions as are nearly universal in the mining districts of the Continent.

6. The successful progress of the *Polytechnic Society of Cornwall*,

chiefly for rewarding the invention and improvement of mining machinery. It appears from the Sixth Annual Report of this Society, (1839,) that the average duration of a miner's life is less, by many years, than that of the Agricultural labourer in the same district, from the various dangers attendant on mining; and the Society aim at the lessening of these tremendous evils, which affect no fewer than 28,000 persons, that being the proportion of the inhabitants of Cornwall, who are occupied in working the mines.

7. The establishment of *Local Geological Museums* at Dudley, Bradford, and Leeds; and the formation of the *West Riding Geological Society*.

8. The formation of a *Museum at the Royal Institution of South Wales*, at Swansea, for collecting facts illustrative of geological phenomena, more especially those of the Coal formation.

9. *The British Museum* has lately received many valuable accessions. Such is the purchase of Mr. T. Hawkins's additional series of the remains of fossil Saurians from the Lias formation; which, added to his former collection, already placed in the Museum, present an unrivalled series of species in the extinct families of *Ichthyosaurus* and *Plesiosaurus*, once inhabitants of Britain. Equally important was the acquisition in the former year, of the unique collection of still more gigantic and not less monstrous reptiles, from the Wealden formation of Kent and Sussex, by purchase from Dr. Mantell*. Thousands of visitors to the British Museum are almost daily attracted to these wonderful discoveries in Palæontology, which, indeed, excite as much popular curiosity as any objects in this magnificent national repository.

The President then referred to the number and value of the *Geological Maps* produced in the previous year, which will be found noticed in the next page.

THE WOLLASTON MEDAL AND FUND.

THE award of these distinctions for 1840, by the Geological Society, is so interesting and encouraging to the lovers of Science, as to entitle the particulars to special record. The Gold Wollaston Medal has been transmitted to M. Dumont, for his great work on the Geological Constitution of the Province of Liege, "such as in 1832 it issued from the hands of a young and then unknown individual, and apart from any more recent attempt to identify the Belgian formation with those of England;" and the Medal is stated to have been awarded by the Geological Society, "in testimony of their admiration of the almost precocious talents then displayed" by M. Dumont, "and of their sense of his worthiness to fill the distinguished scientific position to which he is now advanced, as Professor of Mineralogy and Geology in the College of Liege."

* In the several Topographical Histories now in course of publication, the Natural History, and especially the Geology of the District, forms a prominent Section. Thus, during the past year, Dr. Mantell has written a Geological Survey for Brayley's New *History of Surrey*, illustrated with engravings of Fossil Organic Remains and Sections of Strata of the County.

The year's proceeds of the Wollaston Funds have been awarded to Mr. James de Carle Sowerby, to facilitate the continuation of his researches in Mineral Conchology, and in recognition of Mr. Sowerby's valuable services to Geology. In his reply to the Society, Mr. Sowerby related two instances of the kindness and patience with which Dr. Wollaston communicated information: when the reflecting goniometer was first completed by him, he spent several hours one morning with Mr. S., in his study, measuring the cleavages of various minerals related to Hornblende and Augite, which Mr. S. took to him for his opinion; and at another time he indulged Mr. S. with an equally long lesson on the chemical examination of minute portions of minerals.

IMPROVED MAPS AND MODELS.

SEVERAL statements of valuable improvements in the construction of Maps and Models have been made to the British Association; the principal of which are as follows:—

Mr. Ball exhibited his Map of the County of Mayo, in Ireland, which is on the scale of two inches to a mile, and represents the remarkable physical features of that region; the levels of the mountains, hills, lakes, plains, &c., are all given, both barometrically and trigonometrically, and at the foot of the map is a vertical section of the country from east to west, describing its Geological structure, besides various views, profiles, &c. Accompanying the Map was a Model of 7 feet 6 inches, by 5 feet, on the scale of 4 inches to a mile.

In connexion with Dr. Robinson's recent travels through Palestine, Captain Washington exhibited a newly-constructed plan of the City of Jerusalem, correcting many former inaccuracies, pointing out several ancient sites, and showing the shading of the hills within the city, a feature not represented on any former plan.

Mr. A. Ravenstein, of Francfort, described M. Kumner's Relief Maps, or maps stamped in relief for representing the great physical features of the country, which he considers, will hereafter supersede all other maps,—and especially physico-geographical maps without reference to political divisions. Mr. Ravenstein, however, claims to have first introduced the method of raising the hills, by means of the press or stamping, as may be seen by his "Plastic Atlas," published in 1838; which is quite distinct from M. Kumner's "Globe en relief," published some years since, as that was made of papier-mâché. There was likewise mentioned M. Banerkeller's "Environs de Paris," published in 1839, and executed in the stamped relief method, except that the colours are put in after the Congreve manner.

Captain Washington spoke in high terms of the Maps published in Vienna and Dresden; and of the Models in relief of the Taunus mountains, and the Siebengebirge; as well as of a relief Map of the Rhine, from Mainz to Bonn, by M. Ravenstein. Captain Washington also lauded "the Church Assembly School Maps," published in Edinburgh, and especially the convenient mode by which they were exhibited.

Mr. Greenough, in preparing a new edition of his Geological Map of England and Wales, has found it necessary to have a new Map of Wales, and the adjacent districts, in order to do justice to the great mass of information recently obtained in Wales and the border counties. The chief changes in the other portion of the Map are the divisions in Siluria and South Wales, first established by Mr. Murchison; and the adoption of the classification recently proposed by Professor Sedgwick and Mr. Murchison, for Devonshire and Cornwall. In this new edition, Mr. Greenough has endeavoured to accommodate the colour of the pigment to that of the substance represented; to apply to substances mineralogically similar, dissimilar tints; to place in juxta-position those colours only which would either harmonize or contrast, as the occasion might require; to confine opaque colours to those parts of the maps which are least charged with engraving, to reserve the most formidable colours for the smaller spaces; to denote marked differences in adjoining rocks by strong oppositions of hue; to avoid spottiness; and lastly, to apply the brightest colour to the centre, carrying them off by gradation towards the extremities.

The Government having attached a Geological department to the Ordnance Survey of England and Wales, the first fruits of this appointment are the splendid maps of Devon and Cornwall, and a part of Somerset, coloured after the surveys of M. De la Beche. The statistical importance of this first part of the Ordnance Geological Map of England, will be appreciated by those who are aware that the annual value of the mineral produce of Cornwall and Devon alone has recently amounted to £1,340,000. M. de la Beche has also proved, by tabular documents, the important fact, that the average of the annual produce of the Mines of the British Islands amounts to the enormous sum of £20,000,000, of which about £8,000,000 arise from iron, and £9,000,000 from coal. (See *Geological Report on Devon and Cornwall*, p. 624, and note, 1839.) In this estimate, the value of the copper is taken in the ore, before fusion; that of the iron, lead, zinc, tin, and silver, after fusion, in their first marketable conditon—as pigs, blocks, and ingots. The coal is valued at the pit's mouth.

In the President's Anniversary Address to the Geological Society, Mr. Griffith's large and splendid Geological Map of Ireland is stated to contain the result of nearly thirty years' investigation, by that eminent geologist and civil engineer.

In this Address is also noticed the publication of a beautifully coloured General Geological Map of Germany, France, and England, and parts of the adjoining Countries, compiled from the larger original map of Von Buch, Elie de Beaumont, and Greenough, by Professor Von Dechen, in one large sheet, (Berlin). This Map exhibits the geological details of a larger continuous portion of the surface of the earth than has ever before been put together with so much exactness, and set forth on such eminent authority. It also presents the most important divisions of Central Europe, under the new aspect of the natural division of the mineral formations, of which each

country is composed; showing that in every region the nature and disposition of the substrata lie at the foundation, not only of its agricultural productiveness, but also of its capability of supplying the materials, which form the basis of its industry and arts. As an historical document, this Map demonstrates the rapid progress of Geology, and the state of maturity which it has attained.

NEW GEOLOGICAL THEORY—GLACIERS.

THE most important matter elicited by the late meeting of the British Association, is the New Geological Theory respecting the Agency of Ice in the formation of the upper crust of the earth we now inhabit; by Prof. Agassiz. The subject was introduced to the Geological Section in a communication by the Professor on Boulders and Glaciers in Switzerland. He particularly drew attention to facts relative to the manner and movements of the Glaciers, which he attributes to the continual introduction of water into all their minutest fissures, which, in freezing, continually expands the mass. The effects of the movement, produced by this expansion, upon the rocks beneath the ice, are very remarkable. The bases of the glaciers, and the sides of the valleys which contain them, are always polished and scratched. The fragments of the rocks that fall upon the glaciers are accumulated in longitudinal ridges on the sides of the ice, by the effects of the unequal movement of its middle and lateral masses. The result is longitudinal deposits of stony detritus, which are called *morains;* and as the glaciers are continually pressed forwards, and often in hot summers melted back at their lower extremity, it results, that the polished surfaces, occasioned by friction on the bottom and sides, are left uncovered, and that the *morains*, or curvilinear ridges of gravel, remain upon the rocks formerly covered by the ice, so that we can discover, by the polished surfaces and the *morains*, the extent to which the glaciers have heretofore existed, much beyond the limits they now occupy in the Alpine valleys. It even appears to result from the *facts* mentioned by Professor Agassiz, that enormous masses of ice have, at a former period, covered the great valley of Switzerland, together with the whole chain of the Jura, the sides of which, facing the Alps, are also polished and interspersed with angular erratic rocks, resembling the boulders in the *morains;* but so far different, that the masses of ice, not being there confined between two sides of a valley, their movements were in some respects different—the boulders not being connected in continuous ridges, but dispersed singly over the Jura at different levels. Professor Agassiz conceives that at a certain epoch all the north of Europe, and also the north of Asia and America were covered with a mass of ice, in which the elephants and other mammalia found in the frozen mud and gravel of the arctic regions, were imbedded at the time of their destruction. The author thinks, that when this immense mass of ice began quickly to melt, the currents of water that resulted, transported and deposited the masses of irregularly rounded boulders and gravel which fill the bottoms of the valleys; innumerable boulders having at the same time been transported,

together with mud and gravel, upon the masses of the glaciers then set afloat. Professor Agassiz announced, that these facts are explained at length in the work which he has just published, *Etudes sur les Glaciers de la Suisse*, illustrated by plates, which was laid before the Section.—*Athenæum Report*, No. 677.

In a letter from M. Agassiz in *Leohnhard and Bronn's Jahrbuch*, dated Sept. 18, 1839, appears a notice of the writer's second Tour to the Swiss Glaciers, the most important new fact in which is the forward movement of Hugi's hut on the Aar Glacier. Since the year 1827, it has advanced upwards of 4000 feet. In 1830, Hugi found it some hundred feet from the spot where it was built; in 1836, it was above 2000 feet from it; but in 1839, M. Agassiz found it removed to a distance of 4000 feet from its original position, and still the glacier is very little inclined, and the mass pressing from behind is very inconsiderable compared with the lower mass; so that the explanation of the progressive movement of glaciers, by sliding and pressure from behind, goes for nothing. Hugi's hut proves, in the most distinct manner, that the deeper the glacier the more rapid its movement.—*Jameson's Journal*, No. 57.

Reasoning upon these conclusive proofs, M. Agassiz wished to examine a country where glaciers are no longer met with, but in which they might formerly have existed. He, therefore, directed his attention to Scotland, and had scarcely arrived at Glasgow, when he found remote traces of the action of glaciers, and the nearer he approached the high mountain-chains, these become more distinct; until, at the foot of Ben Nevis, and in the principal valleys, he discovered the *morains* and polished rocky surfaces, just as in the valleys of the Swiss Alps, in the region of existing glaciers; so that the existence of glaciers in Scotland, can no longer be doubted. The parallel roads of Glen Roy are intimately connected with this former occurrence of glaciers, and have been caused by a glacier from Ben Nevis. The phenomenon must have been precisely analogous to the glacier-lakes of the Tyrol, and to the event that took place in the valley of Bagne. —*Letter from M. Agassiz to Prof. Jameson, dated Oct.* 3*.

Supplementary to these facts are the following in the *Literary Gazette*, No. 2142 :—" After hearing M. Agassiz's account of the strong confirmation his opinions had received by examining Ben Nevis, the parallel roads of Glen Roy, &c., we had a future opportunity of learning that equally strong, if not stronger, corroboration of their truth had been derived from the hills in the neighbourhood of Edinburgh, as well as in the north of Ireland, where all the traces on which M. Agassiz

* In the *Scotsman*, the following observation is prefixed to the quotation of the above letter :—"There are other geological phenomena which lead us to conclude that the climate of this country (Scotland) at a former, but, geologically speaking, a recent epoch, was much colder than it now is; and that such a state of things is consistent with the course of nature, is shewn by the fact that Mr. Darwin found glaciers reaching down to the level of the sea on the west coast of Chili, in latitude 46°; that is, 11° nearer the equator than Ben

relies for the proof of his theory are legibly and indelibly impressed. Near Edinburgh, the Calton Hill, the Corstorphine Hills, and Blackmore Hill (by the Pentlands), were inspected by M. Agassiz, Prof. Jameson, and other able northern philosophers. Professor Jameson guided M. Agassiz to sites remarkable in the pursuits of geological information, in all which places M. Agassiz shewed the presence of the striated lines, furrows, &c. &c. which attended the movements of the glaciers of Switzerland, and demonstrate that an immense extent of the arctic and temperate circles lay long under the dominion of ice before the last great change was effected in their condition, and they became the earth, such at it is, on which we exist at the present hour. The phenomena could not be explained by any other means; either by the agency of atmosphere, or water, or fire, or by all combined. As the *morains* are embanked deposits round the icy glacier, so are these marks on rocks the effects of their passage over them. In the three instances we have specified, they are all of igneous formation—trap; the Corstorphine being clink, and the Calton, porphyry. Yet each bears the same appearance, and give like testimony to the one cause by which these appearances could be produced. The sensation created by this discovery, (and by further proofs in the north of England,) is very great; and we may safely predict that no future views in geology will ever be taken without the agency of ice making a much more important figure than it has hitherto done in accounting for the condition of our globe's external surface."

We may here mention that M. Renoir has found the same indications in the Glaciers on the southern side of the Mountain-chain of the Vosges; and a translation of his paper, from the *Bulletin de la Société Géologique de France*, will be found in *Jameson's Journal*, No. 58*; as also a paper by M. Studer "On some Phenomena of the Deluvian Epoch;" both bearing upon this very interesting investigation.

After the reading of M. Renoir's paper, M. Constant Prevost observed that he had seen on the road to Chambery presumed corroborations of the theory of M. Renoir. M. Leblanc then stated that Prof. Fergeaud, of Strasburg, had discovered analogous phenomena in the mountains of the Black Forest, in those of the Vosges and Pyrenees, which he had lately examined, and which he also endeavoured to explain by the theory of glaciers. M. de Roys, however, considered that he could not refer to this cause similar indications to the above, which he had observed in the chain of the Alpines, between St. Remy and Arles.

The paramount importance of this New Theory has excited equal discussion among the leading Geologists of our own country; and various were their opinions expressed at the meeting of the British Association. M. Agassiz's paper on the subject was the only business brought forward at the first meeting for the season of the Geological Society of London, on Nov. 4. A paper by Prof. Buckland also, "On Glaciers, and their former existence in Scotland and England,"

* This Number also contains a Note on the origin of Fissures in Glaciers, by M. Martins, of Paris; and, another Note, by Berzelius, on Sefström's Investigations of the Furrows on Rocks.

was then commenced; and was concluded on the 18th: and these have been followed by a paper by Mr. Lyell, "On the Geological Evidences of Glaciers in Forfarshire;" and a paper "On the Evidence of Glaciers in the North of England," by Prof. Buckland. The latter of these papers being concluded only in December, the whole subject may, at the period we are writing, (Jan. 6, 1841,) be considered *adhuc sub judice.*

NATURAL TERRACES ON THE EILDON HILLS.

A RECENT paper on the Glen Roy Parallel Roads, by Mr. Darwin, (published in the *Philosophical Transactions,*) has had the effect of calling the attention of the leader of a Geological Society, Mr. W. Kemp, resident in the town of Galashiels, in Selkirkshire, to certain appearances of the same kind on the hills around that town. The resulting series of observations and measurements is contained in an ably drawn up paper in *Chambers's Edinburgh Journal*, No. 444, (August): the writer of which, having accompanied Mr. Kemp over the whole ground, is satisfied with these appearances being of the same character as those of Glen Roy, though, in general, less conspicuously marked. The number of Terraces enumerated by Mr. Kemp is sixteen, and he describes them as running along the sides of many of the hills round Galashiels, Melrose, Abbotsford, &c. in perfectly horizontal lines, and parallel to each other; and they are, in the opinion of their discoverer, so many different ancient beaches or land levels, at which the sea must successively have stood for long periods. To this theory, Mr. J. E. Bowman, F.L.S. & F.G.S., offers several apparently well-founded objections, in a paper in the *Annals and Magazine of Natural History*, No. 36; adding that, "whether the theory proposed by Mr. Kemp be the true one or not, the merit of having first discovered, and then worked out, these terraces, with such ability and perseverance, will ever be his own."

HEIGHT OF THE COAST-LINE OF FUSI.

IN the account of the results of the French Northern Scientific Expedition, it is stated, that the determination of the mean level of the sea has permitted the measurement, at a great many points, of the line of marine algæ, *(Fucus vesiculosus)*; a line which is horizontal and well defined, forming for the observer a very good mark along the whole coast of Finmark. At the same time, a verification was obtained of the continuity of the lines and terraces which indicated the level of the sea at remote periods. It appears thus, that there is a want of horizontality in these lines. Thus, the superior line of the Alton Fiord, where it attains a height of 67 yards, gradually becomes lower towards the open sea, and has only a height of 28 yards in the neighbourhood of Hammerfest. These results are interesting to geologists and Prof. Jameson has recommended to the members of the Wernerian Society that comparative measurements should be made on the coasts of Scotland and its islands, with a view of collecting information regarding a phenomenon which appears to bear so

directly on the question of the supposed elevation of the land, or the depression of the sea.—*Jameson's Journal*, Nos. 57 and 58.

CHANGES OF LEVEL LAND AND SEA.

A PAPER, by Mr. Stevenson, "On Changes of Level Land and Sea," the details of which are stated to be of very great importance, has been read to the British Association, by Mr. Smith, who has devoted some years of careful research to the subject. The gist of Mr. Stevenson's argument is, that a universal waste of coast has taken place, with few exceptions, caused by local circumstances. Mr. Smith confined his remarks to the great basin of the Clyde. It consisted of three beds. The lowest, *i. e.* below the tertiary formations, was that of diluvium, which other geologists had called *till*, and which, in other parts of the island, was marked by the occurrence of erratic blocks. The second, which was one of the tertiary series, might be described as the clay of which bricks and tiles were made. In it marine remains were found in abundance. The third he might denominate as belonging to the historical period, as ancient boats, and wood for various uses, had been discovered in the sands of which it was composed. These sands were evidently fluviatile, and contained no marine shells. The lower parts of Glasgow stood upon this bed. Such was the general formation of the valley, though, at a great distance, there were other distributions of strata, which probably showed that a considerable change in the climate had taken place. By "tertiary," Mr. Smith understood strata in which the proportion of shells of extinct species was found, as in the present case, to the extent of fifteen per cent. He also noticed, that the sands to which he had referred, were, in one instance, traversed by a trap-dyke, as if an igneous origin might be ascribed to this part of the formation. The bed exhibited a fall of forty feet to the level of the water, and, in his opinion, the historical period embraced only a small part of the present physical structure. The stratum he had particularized as the brick clay, was 100 feet above the level; and seemed as if it had been formed at the tranquil bottom of the sea, at a period far remote. It extended throughout the entire valley of the Clyde; and he believed a corresponding feature was found in the Cast clay which occupied the valleys of the Tay and Forth. In the diluvium below the tertiary, there had been discovered the remains of the mammoth, the deer, and other races, which were not distinctly ascertained. Below this, in some places, but rarely, were stratified beds, the till resting generally on old sandstone, where violence in the position was very obvious. One thing had struck him forcibly whilst making these observations, that the shells found were of the same kind as those now obtained from the Arctic regions, Behring's Straits, and more northern shores. From this he deduced the fact, that our climate of old had been much colder than now, and these deposits were made in the strata he had thus briefly described.

Mr. Lyell concurred in the opinion, that the latter fact demonstrated a change of climate from a colder to a warmer condition, and fancied this change might be connected with the phenomena of the erratic block, and the period of deposition.

The phenomena noticed by Mr. Smith, of a fall of 40 feet in the sand strata, appeared to Mr. De la Beche very remarkable; for, engaged as he had been lately in Government works in Wales, and making accurate measurements, he had ascertained 40 feet to be the maximum height of the same strata in that country, and in Devonshire and Cornwall; which showed this change of level between land and sea to have taken place over a great area, embracing, probably, the whole, or nearly the whole, of our island.

Dr. Buckland made a few observations on the extraordinary fact of shells, (if in the till where elephant remains were found,) being similar to the Arctic species. He also remarked on the lapse of time being no certain measure for the absence of shells in any deposit; and on the occurrence of basalt dykes in such sands as Mr. Smith had referred to, which remained for ages, whilst the more perishable matter by their sides was removed. A single storm which might occur in a hundred or five hundred years did more to change the nature of a shore than the common action of the waves for centuries. Happening at high tides, such storms would completely alter the face of the land; and therefore, it was an error to argue from such premises on the lapse of years as the cause of the observed phenomena. He compared the sedimentary deposits in valleys to the contents of slop basins, where one substance was thrown after another, and sunk in layers to the bottom; and mentioned some curious tracks of deer and large oxen on clay, subjacent to a bed of peat, recently discovered in excavating for a dock at Pembray, in Pembrokeshire. The lower peat was moulded into the footsteps of these animals; and similar impressions were found on the upper surface of the peat under a bed of salt, whilst the bones of both the deer and oxen were lying in the peat itself. Similar tracks were also noticed in the excavations for another harbour on the coast of Neath. Mr. Smith answered, that he had found shells in the till but only of two species; and that they were very rarely to be met with. —*Abridged from the Literary Gazette*, No. 1236.

THE TEMPLE OF SERAPIS.

Russager, in a letter addressed to Professor Leonhard, from Naples, differs entirely from Arago and others, who maintain that the surface on which the Temple of Serapis stands has been depressed, has remained under the sea, and has again been elevated. There is nothing, he adds, in the vicinity of the temple, or in the temple itself, which affords proofs to justify this too bold hypothesis. Every thing rather leads to the belief, that the temple has remained unchanged, in the position in which it was originally built; but that the sea rose, surrounded it to a height of at least 12 feet, and again retired. The elevated position of the sea continued sufficiently long to admit of the Pholas

boring the pillars. This view can even be proved historically: for the Cav. Niccolini has just published a Memoir, in which he gives the heights of the level of the sea in the Bay of Naples for a period of 1,900 years, and has, with much acuteness, proved his assertions historically. The correctness of Russeger's opinion, he states, can be demonstrated and reduced to figures, by means of the dates collected by the Cav. Niccolini.—*Jameson's Journal*, No. 58.

DEPTH OF THE SEA.

THE Sea was recently sounded by lead and line in lat. 57° south, and 85° 7′ west longitude from Paris, by the officers of the French ship, *Vénus*, during a voyage of discovery: at a depth of 3,470 yards, or nearly two miles, no bottom was found. The weather was very severe; and it is said that hauling in the lead took 60 sailors upwards of two hours. In another place in the Pacific Ocean, no bottom was found at the depth of 4,140 yards.—*American Newspaper*, Nov. 18.

Capt. James Ross, in a letter to the Geographical Society, details some enormous soundings made by him at Sea: one of these, 900 miles west of St. Helena, extended to the depth of 5000 fathoms, or 30,000 feet, the weight employed amounting to 450lbs. Another made in lat. 33°5, and lon. 9° W., about 300 miles west of the Cape of Good Hope, occupied 49½ minutes, in which time 2226 fathoms were sounded. These facts are thought to disprove the common opinion, that soundings could not be obtained at very great depths.

TEMPERATURE OF THE OCEAN.

THE Thermometrograph, with its case, employed by Capt. Dupetit Thouars, during his voyage in the *Vénus*, in the South Seas, to obtain the temperature of the Sea at very great depths, having been broken by the enormous pressure of the water; it became an object of interest to know at what precise point of the scale the index had stopped, when the compression took place. The case itself had a diameter of 33 millimetres internally, and the sides, in the best brass, were 15 millimetres and a half thick. The action, however, of the ocean had squeezed the case completely flat. M. de Tessau, of the Engineers, was, therefore, commissioned to open the Thermometrograph with due precaution; and the result of his examination was communicated to the Academy of Sciences, at Paris, on Sept. 7. It then appeared that the index had marked 1·6 to 1·7 above zero of the Centigrade scale, at the moment of the instrument breaking; and the depth at which it occurred must have been somewhere about 3,800 metres. This exact indication of the great cold of the water at such immense depths, excited a great sensation among the members of the Academy present.—*Literary Gazette*, No. 1235.

HEIGHT OF WAVES.

THE highest wave which struck the French ship *Vénus*, during her voyage, was 7·5 metres (23 feet); the longest wave was met with in

the south of New Holland, and was three times the length of the frigate, or 150 metres (492 feet).—*Athenæum*, No. 687.

ENCROACHMENT OF THE SEA.

THE Sea, it is stated, is encroaching upon every part of the Cornish coast. In the memory of persons still living, cricketers were unable to throw a ball across the Western Green, between Penzance and Newby, which is now not many feet in breadth. At a very remote period, tradition relates that a considerable part of the present bay of Penzance was land covered with wood, but which, by an awful convulsion and irruption of the sea, was suddenly swept away. There is a letter extant, written in the reign of Charles II., to the then proprietor of an estate, which included part of the Western Green, and that part is estimated at 36 acres of pasturage.—*Penzance Gazette.*

Captain Parkinson, writing from Sheerness, states that the village and church of Warden, in the Isle of Sheppy, are now covered by the sea; that between June, 1839, and May, 1840, a great part of Warden Point, Sheerness, slipped into the sea; and great part of the island, from Warden to Minster, is monthly going the same way, from underground springs and want of drainage. In the old *History of Hampshire*, it is stated that the people daily forded or waded across with their cattle from the Forest to Vectis to graze; now first-rate men-of-war can sail over this place. The destruction of the western side of the island is much hastened by the removal of stones and gravel for building and road-making.—*Civil Engineer and Architect's Journal*, No. 33.

CORAL ROCKS IN THE MAURITIUS.

ON June 10, was read to the Geological Society, a letter addressed to Mr. Murchison by Captain Lloyd, on the occurrence of Coral Rocks in the Mauritius, at a considerable distance from the shore, and at heights varying from 10 to 25 feet. The Mauritius is belted by an enormous coral reef throughout its whole circumference, except for about ten miles along the extreme southern side, where the coast is bold, and consists of basalt. Two of the masses of coral rocks described by Captain Lloyd, are situate in the valley of Petit Savanne, and form remarkable points or headlands, from 20 to 25 feet above the present level of the sea; whilst they present the same marks of abrasion as the existing barrier reef. The Observatory, Port Louis, is built also on a stratum of very hard coral rock, ten feet above the level of the sea. There are besides in several parts of the island enormous blocks of coral, surrounded by the debris of oysters and other shells and corals.

THE RHONE AND THE LAKE OF GENEVA.

FOR some time past, there has been devising the possibility of regulating the course of the Rhine, so as to control in some measure the quantity of its water entering the Lake of Geneva, and occasioning disastrous consequences, such as those which occurred at Lyons in

November*. With this object, Professor Colladon has made the following calculations:—"The Lake of Geneva supplies, on an average, during the autumn, 400 cubic metres of water, per second, to the Rhone; more than one-half of which is now shut out by a bar; but a better constructed bar would shut out three-fourths. This volume, moving at the rate of about 20 metres per second, arrives at Lyons in 24 hours; whereas the closing of the bar could be effected in less than 20 hours. First, time would be given to the large intermediate streams partly to run off. The general effect may easily be calculated. Supposing the Rhone to be at the bridge of Merand 200 metres in width, and the mean rate of current two metres, 70 centimetres, which is tolerably correct, this reduction of 300 cubic metres per second would produce on the level of the river at Lyons a diminution of about 21 inches. As the waters of the Lake are always near their mean level during the rainy season, this momentary increase would be unattended with inconvenience; indeed, the level of the Lake would not reach its summer maximum. A better means of barring the Lake, and which would prevent the decrease of water in the winter, would be a great benefit to all the inhabitants of the borders, as the navigation would no longer be checked in the winter."—From the *Fédéral, of Geneva; Galignani's Messenger; Times*, Nov. 25.

STRATIFIED ROCKS.

On Jan. 25, Prof. Jameson stated to the Wernerian Society, his views in regard to the so-called stratified structure of primitive rocks, which he, in conformity with his papers in the *Philosophical Journal*, and others read before the Society at different times, is still disposed to consider as an effect of crystallization; and therefore, strictly speaking, a tabular, not a true stratified, structure.—*Jameson's Journal*, No. 56.

OXIDES OF COPPER AND TIN IN SPRING WATER.

Berzelius, in an analysis of spring water from Saidschütz, in Bohemia, has discovered traces of oxide of tin and oxide of copper, which he thinks may be traced to the olivine of the plutonic rocks from

* For the last hundred years, the Rhone has not been known to rise to such a height as in October and November, 1840. On October 27, and four following days, there fell in Lyons, rain, which measured 32 centimetres, or rather more than 12 1-8ths English inches, an unusually large quantity; the average at Lyons, per annum, being 54 centimetres, or 24 inches 1-10th. On November 11, at Nismes, the inundation covered an extent of 36 leagues in length, by 60, at least, in width. At Beaucaire, as far as the eye could reach, the country presented one immense sheet of water, above which rose the tops of the trees, and roofs of the houses, upon which the inhabitants had taken refuge. A naturalist, residing at Alguemortes, near the mouth of the Rhone, states that during the inundations, he saw on the banks of sand in the middle of the waters, numerous bulls, horses, foxes, polecats, rabbits, rats, and other animals, usually hostile to each other, congregated together, without doing each other harm; and among them were a great number of snakes. A man, who had taken refuge in a tree, found it impossible to prevent several snakes taking shelter under his clothes.

which it flows; the olivine, he adds, affording traces of these two oxides.—*Jameson's Journal*, No. 56.

RECENT DEPOSITS OF SALT.

M. ENGELHARD states that mining implements have been discovered in the Salt-mines of Hallein, and in such a position, in regard to the beds of rock-salt at present worked, as to lead to the conclusion that deposits of salt have taken place since the commencement of the working of these mines, and have been formed by the action of water on the previously existing beds of rock-salt. This fact is interesting in many respects, and affords a warning to geologists to be careful to distinguish between original and ancient deposits, and those of a very recent date formed by the action of water and air on ancient formations.—*Jameson's Journal*, No. 56.

ARTESIAN WELL AT PARIS.

ON February 17, it was reported to the Academy of Sciences, at Paris, that the Artesian Well then boring in the Abattoir de Grenelle, had reached a depth of 508 metres, the strata being as follow:—Alluvium, 30 metres; plastic clay, 30; white chalk and flint, 400; argillaceous chalk, blue and green, without flint, 40; blue clay, fossiliferous, with pyrites, 8;—total, 508. Beneath this stratum lay a bed of sand, in which water was expected to be found. The lower part of the bore was then lined with a tube for experiments on central heat.

On Sept. 14, M. Walferdin communicated to the Academy the exact note of the temperature at the bottom of the above well, as recently determined: it was 26·43° Centig., at a depth of 505 metres. Hence, since the mean temperature at the surface is 10·6°, it may be inferred that the temperature increases one degree for every 31·9 metres of depth. Similar experiments in the well of the Observatory had given one degree of increased temperature for every 32·3 metres increased depth: at the Military School, it was one degree for every 30·85 metres; and, at St. André, in the Jura, one degree for every 31 metres.

ABSORBENT ARTESIAN WELLS.

THE most important results are expected from Absorbent Artesian Wells, or Cesspools, an application of boring already practised to a considerable extent in France. These works, it is anticipated, will place new resources within reach of the engineer. They will afford the means of draining marshes, which otherwise could only be cleared by difficult or expensive processes. Their application to sewerage will enable us to relieve many small streams, which receive the sewerage of large and dense populations; and in every way they give the engineer abundant promise of variously contributing to the public health. The extension of the system at Paris is proceeding rapidly; and it is hoped that it will be equally introduced into London, which lies in a similar

geological position. The marshy districts of Hackney, Lambeth, and Woolwich, might be thus relieved; and, instead of Mr. Martin's expensive plan for the improvement of the sewerage, the Thames might be much more easily relieved by the filth being turned into absorbent wells. It may be inferred that the dirty water becomes disinfected much more certainly, and so returned much sooner into circulation, by being dispersed in the under-current, than in the superficial waters. —*Mr. Hyde Clarke, C. E.; in Civil Engineer and Arch. Journal*, No. 31.

An Absorbent Well has been formed in the fosse of the Château de Vincennes, near Paris, to carry off the stagnant water: the bore was made 300 feet deep; and in the plastic clay lying over the chalk, there was found a stratum of sand, which, in a few days, absorbed a quarter of the water of the fosse.

PETROLEUM OIL WELL.

About ten years since, whilst boring for salt water, near Burtesville, Kentucky, after penetrating through solid rock, upwards of 200 feet, a fountain of pure Oil was struck, which was thrown up more than twelve feet above the surface of the earth. At first, it emitted 75 gallons a minute, after which it continued to flow more slowly for several days successively. The well being near the mouth of a small creek emptying into Cumberland river, the oil soon found its way thither, and for a long time covered its surface. On a torch being applied, the river blazed, and the flames soon climbed and scorched the loftiest trees and cliffs. The oil ignites freely, and produces a flame as brilliant as gas. Upon exposure to the air, it assumes a greenish hue. It is extremely volatile, has a strong, pungent, and indescribable smell, and tastes much like the heart of pitch-pine. It flows spontaneously, and there have been two such flowings within the two last years. The second commenced on July 4, and continued about six weeks, during which time about 20 barrels of oil were obtained. The oil and the salt water, with which it is invariably combined during these flowings, are forced up by the gas, above 200 feet, into the pump, and thence through a spout, into a covered trough, where the water soon becomes disengaged, and settles at the bottom, whilst the oil is readily skimmed from the surface. A rumbling noise, resembling distant thunder, uniformly attends the flowing of the oil, whilst the gas, which is then visible and oily at the top of the pump, leads the passing stranger to inquire whether the well is on fire.—*Abridged from Silliman's Journal.*

GEOLOGY OF RUSSIA.

Mr. Murchison has given to the British Association a sketch, or outline, of his recent Geological Tour in Russia, preparatory to his submitting it to the Geological and other Societies. Previous to examining the country, he thought that his Silurian system of sedimentary deposits must prevail in it to a great extent; but he had no idea of the vastness of the proof of the correctness by the prodigious range

covered by these deposits, and also of the overlying rocks, which added most valuable evidence of the very same formation. Here he found an immense area, not interfered with by igneous rocks, and extending for thousands of miles from the north to the neighbourhood of Moscow. He has, indeed, experienced great difficulty in investigating the geological features of the country, in consequence of the great quantity of detritus, of drifted mud, sand, and boulders, and masses of granite, which have been borne down and left on the surface of the original formation. No evidence of succession could be obtained, and it was not till going to Petersburg that he met with such intelligence as enabled him to pursue his object to a successful result. Mr. Murchison more than once spoke of the aid given him by the Russian government, and eminent natives of the country; and thus helped, he has clearly established the fact that the oldest sedimentary deposits are decidedly Silurian.

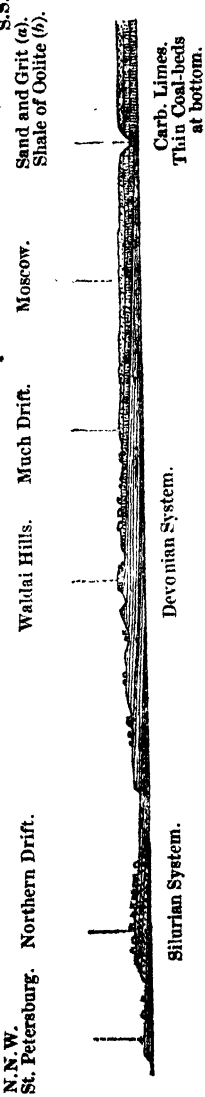
A section of the country was exhibited, which Mr. B. Ibbetson had drawn and coloured with extraordinary expedition, and which distinctly, though roughly, pointed out the exact position of these strata. *(See the Cut.)*

1. The blue clay of St. Petersburg, in which no organic remains were discovered.

2. A peculiar sandstone, in which were found two fossils of a new character.

3. Limestone exactly like that of Dudley, though with some difference in the mineral masses it contained, but agreeing in the shells, trilobites, ammonites, &c. which abound in immense quantities.

Mr. Murchison then described the course he had taken, and the means by which he had identified the Russian formation with the upper Silurian. He has examined all the deep ravines through which rivers flow in a transverse direction. In this manner, he detected the order of superposition; and found that the formations spread to the east and west, and are lost in the north under immense masses of granite detritus of varied character. Returning to the stratification already specified, he observed that an enormous stratum of flagstone overlaid the limestone of the Silurian series;—a great red



formation, which he had previously thought to be the new red sandstone, characterised by salt and gypsum; but, on examination, he found it to be in reality the true old red sandstone of the Devonian system. It contained the same fossils, and the same fishes, with the same scales, as were obtained in Scotland and England; and thus unquestionable proof of identity of rocks was offered, and the question set at rest for ever. He expressed his delight at gathering this result from the remarkable collocation of shells and fishes found so abundantly in Russia, and the confirmation of the theory seemed to give great pleasure to the geologists in the meeting. Higher up, above the red sandstone, was marl and impure limestone, in which, besides the *Holoptychus*, new fishes were found which he would call on M. Agassiz to point out. The *Holoptychus* was the same as that largely found in Scotland, and of which there is a specimen in the British Museum no less than three feet five inches in length. They abound in the Russian sandstone for many hundred miles, and are in vast quantities near Dorpat*. Mr. Murchison then adverted to Waldai, half-way between Petersburg and Moscow, as a place where the superposition of the strata he had been describing was most beautifully illustrated. Ascending still higher he arrived at another series—the carboniferous system, with entirely different shells. It consisted, first, of a yellow sand; and, secondly, coal, shale, with plants, the same as in Scotland. He particularised the *Megalichthys* and the *Holoptychus Nobelissimus*, (so named after Mr. Noble,) as belonging to this formation. Above it lay the carboniferous system proper, yet marked by some mineral discrepancies as in the white limestone of Moscow, but with the same productæ and other fossils as occur in the carboniferous limestone of England. This limestone resembles our chalk, and ranges a thousand English miles, in flat normal masses, which have never been disturbed. Thirty or forty of its fossils were the same as those described by Mr. Sowerby and Mr. Phillips. Mr. Murchison expressed his astonishment at seeing wonderful cliffs of white alabaster, interlaminated by calcareous bands, in which were fossils, perhaps new to the science. Next in the series was a deposit widely separated from the foregoing in age, and presenting the startling fact of there being no intermediate beds between the carboniferous system and the oolites; no tertiary deposits of eocene or miocene periods, nor of the age of pliocene. He has, however, made the important discovery on the Dwina, above Archangel, of a blue shale with a multitude of shells identical with those left on the shores of the White Sea. He has gathered there a trayfull of them, of existing species, and yet 300 feet above the level of the sea. The result of the whole is, that at a recent geological period all Russia was covered by the sea to the banks of the Ural mountains. He has traced the mighty blocks of northern Scandinavian origin, diminishing in size and number as they descend towards the south,

* Some of the new fossil fishes were placed on the table among the other numerous known specimens, and were of extraordinary form. One, in particular, had wings so like a butterfly that it was hardly possible to discriminate it from the insect.

and where the drift changes. The Silurian system is complete, and the white formation added with bands of silex of the true carboniferous system, and not chalk-flints. There are also peculiar trap-rocks, shewing the exact line of the drift from the north, or N.N.W.

Mr. Lyell congratulated the meeting on the proof of the Silurian system being now complete. To Mr. Murchison and his successful campaign in the north, they were indebted for the clear classification of the Silurian and Devonian formations. The link that was wanting in that classification, it now appears, the geology of Russia is admirably calculated to supply. Some of the descriptions they had heard agreed very much with what he had witnessed in Sweden and Norway —the fact, for instance, that these very masses of Silurian strata run for thousands of miles, in a horizontal position, over a large portion of Europe. There is here, too, evidence of a gradual rising in Russia, such as was now taking place in Sweden—either such an upheaval as that going on in Sweden, or such a depression as is now going on in Greenland. He also remarked on the gradual loss of species in the fossil remains, and the introduction of new: not the extinction of whole races, but partial operations in different localities of the same age; for deposits containing different animal remains might be going on at the same time, and there was nothing universal. Yet the organic characters were the only guides they had to the age of the various strata of which the crust of the globe was composed; though Alps and Pyrenees might be appearing, whilst all was tranquil in the deposits here. The height of the shale to which Mr. Murchison alluded, is about 500 feet.

Some conversation ensued respecting the Baltic shells, and the number of oceanic remains, found more than 200 feet above the level of the sea, near Stockholm. This was considered to demonstrate a more moderate date for the geological formation of Russia.—*Literary Gazette*, No. 1241; *somewhat abridged.*

GEOLOGY OF CANADA.

A PAPER has been read to the British Association, "On the Geology of Canada," by Captain Baddeley, in which the author regrets that so little has been done towards a universal survey of this important colony. It possesses an abundance of iron-ore, magnetic and red argillaceous oxide; also lead and copper. The part of Canada most metalliferous seems to coincide with a similar region in the state of New York; particularly the country behind Belleville, Kingston, Brockville, and Prescott, near the junction of the primary and secondary formations. Some pieces of native gold have been discovered, but scarcely any indications of coal; although in the upper province, from the occurrence of saliferous strata, there is a greater likelihood of its being found; these strata occur near Toronto, and towards Lakes Erie and Huron.

In a conversation which followed the reading of the above paper, Mr. Greenough spoke of the importance of an accurate geological survey of the United States' boundary, as, in former treaties, our Government have parted with valuable mineral tracts: he instanced the

island of Banca, now so important for its tin mines. Dr. Buckland mentioned that large quantities of lime have been sent, at a great expense, to Gibraltar, the fortifications of which are built on a limestone rock.

TRAP IN THE MENDIP HILLS.

On June 10th, was read to the Geological Society, a notice, by the Rev. D. Williams, of an extensive mass of Trap in the mountain limestone at the western extremity of Bleadon Hill, and laid open by the excavations for the Bristol and Exeter Railway. This is the first discovery of trap in the line of the Mendip Hills; and the only igneous rock hitherto detected in Somersetshire, with the exception of the syenite of Hestercombe, north of Taunton, described by Mr. Horner, and a slaty porphyry observed by Mr. Williams, a little north of Simmons-birth, in Exmoor.

PARAMOUDRAS AND BOULDERS FROM NORFOLK AND SUFFOLK.

On January 2d, was read to the Geological Society, a letter from the Rev. J. Gunn to Dr. Buckland; accompanied by three Paramoudras, or gigantic cup-shaped chalk flints, and a series of specimens from the Boulders found in the diluvial accumulations of Norfolk and Suffolk, and derived originally from strata belonging to the oolitic series. The letter contains, besides, some observations on the tendency of Paramoudras to assume a tuberculated outline, where they are in contact with horizontal layers of flint, remarks on the vertical pipes, or "sand galls" in chalk; and Mr. Gunn infers, from their being filled with only sand, gravel, or crag, that they were not formed during the eocene period. With respect to the boulder accumulations, he is of opinion that they were derived from the action of waves on ancient lines of sea-coast; and that the boulders themselves are the remains of the formations which, at one geological period, constituted the shores of the London basin.—*Athenæum*, No. 637.

BENDABLE STONE.

In the Museum of the Asiatic Society at Calcutta, one object of curiosity is a Bending or Elastic Stone. This stone is, apparently, of granite, is about two and a half feet by six inches in length and breadth, and about an inch thick. The stone being lifted at one end, yields to the pressure, and from the half begins to bend as it is lifted, and as one end is raised the bend approaches nearer to the further extremities. On the stone being laid down, it reverts to its former —*Calcutta Paper.*

STRONTIANITE IN WESTPHALIA.

Very lately, veins of this interesting but comparatively rare mineral have been discovered near the Hamm, in Westphalia. The veins, which traverse rocks of the chalk series, are from 1 inch to 2 feet in breadth, but their other dimensions have not been ascertained. Its

colour is white. It occurs in granular distinct concretions, from 2 to 3 inches in diameter; and these again are composed of scopiformly disposed prismatic concretions. Crystallized varieties are also met with. According to Professor Breks, it affords on analysis in 100 parts, 94.700 carbonate of strontia, 5.220 carbonate of lime, and a trace of iron and water. The carbonate of lime appears to be mechanically mixed. It is collected in hundreds of pounds, and hence these veins promise to yield strontianite in such quantity as to render them important in an economical point of view.—*Jameson's Journal*, No. 58.

THE SUN-STONE IN SIBERIA.

THE Sun-stone is a variety of felspar, which when viewed in the direction of its chief cleavage planes, displays numberless golden spangles, which are distinctly seen in sun-light, or better by the light of a candle; while in other directions it shows only a brown colour. It occurs on the Selenga, in Siberia, forming, with quartz, considerable veins; where it is stated to be found in masses sufficiently large to allow of their being fashioned into vases 2 feet high. These will be of great value, as ring-stones of this variety of felspar sell at a considerable price.—*Jameson's Journal*, No. 58.

NATIVE GOLD IN SUTHERLANDSHIRE.

A ROUNDED piece of Native Gold, weighing rather more than half an ounce, was found some years ago, in the bed of the Kildonan, a rapid mountain stream in Sutherland.—*Statistical Report.*

FROG FOUND IN COAL.

As two colliers were in one of the rooms of the Old Meirfield pit, at Gargieston, they found a living Frog imbedded in the solid seam of Coal, at least twelve fathoms beneath the surface of the earth. The niche in which it had lived was perfectly smooth inside, of the exact shape of the frog, and without a crack or crevice to give admittance to air. The hind legs of the frog were, at least, a third longer than usual, the fore legs shorter, the toes longer and harder, and its general colour was of a bronze shade. It leaped briskly about, the moment that it was excavated from its narrow cell.—*Edinburgh Courant*, June, 1840.

FOSSIL ORGANIC REMAINS.

Brazil.—M. Lund, in a late communication to the *Annales des Sciences Naturelles*, dated Lagoa Santa, April 1st, 1840, enumerates an increased list of Fossil * Mammalia, amounting to 101 species. Among the more interesting of his discoveries, is the metatarsal bone of a horse, of a larger and more flattened form than the corresponding bones in the living species. This he has named *Equus neogæus*.

* For M. Lund's former list, see Year-book of Facts, 1840, p. 260.

Numerous remains of birds have been met with, among which are those of two species of *Rhea*, one of them in size much exceeding that of the existing *Rhea Americana.—Annals; and Magazine of Natural History*, No. 38.

Mammoth.—M. Wrangell observes: "Without speculating concerning the manner in which these antediluvian remains came into their present situations, I would call attention to the remarkable fact, that the teeth, tusks, and bowels, which are called by the general name of Mammoth bones, but which, probably, belong to several different species of animals, are not distributed equally over Siberia, but form immense local accumulations, which become both richer and more extensive the farther one advances to the north. They are found in the greatest abundance in New Siberia and the Lachow Islands, as mentioned by Reschetnikow and Samiskow. Many hundred pood, (*pood* equal to 36lb. avoirdupois,) weight are collected there every year; whereas, on the Continent, they are much scarcer, and are hardly ever met with in the southern part of Siberia."

Elephants, &c.—MM. Riviere and Briggs have discovered some Elephant bones between Joinville le Pont and Champigny. They are placed in sand, which presents this section:—Vegetable, earth, and alluvium, diluvial flinty deposit, diluvial sand; and, lastly, sand very rich in fossil bones, and superior to that of the Marne and Seine. Gaultier de Claubry states, also, that a vertebra of the Palæotherium, and some remains of a crocodile and fishes, have been discovered in the coal-field of Bert, in the department of Allier.—*Athenæum*, No. 687.

Reindeer.—M. de Blainville has reported to the Academy of Sciences, at Paris, two Memoirs by M. Ruel, on some Reindeer bones found in the Faille de Brengues. About 600 bones, belonging to twelve or thirteen individuals of the same species, have been obtained at this spot, and they are enough to form a complete skeleton. They were covered with a reddish argillaceous earth; and, among them, besides numerous fragments of horns, there was a skull sufficiently complete to show the extreme narrowness of the parietal bone, and the circular space occupied by the horns. These bones, and the skull in particular, have enabled M. Puel to affirm that the fossil and living species of reindeer are *identical*. Among the bones found in that locality, there were many of hares, horses, asses, oxen, the auroch or urus, and the rhinoceros, together with those of a stag, as large as the stag of Canada, as well as bones of partridges and other birds. No bones of any carnivorous animal whatever were found in the Faille de Brengues. In this cavern, the rolled gravelly fragments contained rocks from very distant localities; and there is a chance of the direction of the current which filled it being discovered.—*Literary Gazette*, No. 1235.

Auroch Horns.—A pair of these enormous horns, held to be of the primitive bull, have been found in the river Seille, near Tournon. Though broken at the tips, they are three-quarters of a yard long, and five inches in diameter at the base.

Bird.—M. Hermann S. Meyer observes, in *Leonhard and Bronn's Jahrbuch*, 1839; "The *Ornithichnites* made known by Hitchcock, in North America, can afford no proof of the occurrence of birds in rocks antecedent to the tertiary period, to me, who am a decided opponent of the view, that the appearance presented by the older sandstone formations, which have made so much noise at the present day, and which undoubtedly deserve attention, have been certainly produced by the footsteps of animals. There is also, however, the fragment of bone from the Hastings-sand of Tilgate-forest, which has been examined by Owen, who has declared it to be the tarso-metatarsal bone of a wader, resembling a heron, on account of the bone presenting an oval spot, denoting the articular surface or place of attachment of the posterior or opposable toe, and of the indications of longitudinal ridges of bone, which in the metatarsals of birds, afford attachment to the aponeurotic thecæ, that tie down the tendons as they glide along the metatarsus of the toes. But in this instance, the lower extremity of the bone is wanting, and the other bones found along with it seem to have belonged to a Pterodactylus, rather than to birds, although they have been referred to the latter. Thus, the important question, as to the occurrence of the remains of birds in formations antecedent to the tertiary series, was, by no means, satisfactorily determined; and in consequence of the striking approximations to birds, lately discovered by me to exist in the Pterodactyles, I had so much the more reason for believing fossil birds to be confined to the tertiary strata. I was, therefore, not a little surprised at the sight of a slab of glarus slate, lately sent to me from Zürich. This rock has been rendered remarkable by its fossil fishes, and by its *Chelonia Knorri;* it was formerly, on account of its petrographical characters, considered of great age, but subsequently, from the nature of the fossil fishes it contains, has been determined by Agassiz to be a formation of the age of chalk. On the slab forwarded to me, I found the remains of the skeleton of an animal, which can have been nothing else but a bird; and this view is placed beyond all doubt by the distinctly preserved bones of the wing and foot. The feet cannot have been adapted for wading, and the bird cannot, therefore, have belonged to the *Grallæ;* it would seem rather to have been one of the *Passerinæ*, and of the size of a lark."—*Jameson's Journal*, No. 57; *abridged.*

New Dolphin.—Among the fragments of some remains recently found in the Prussian states, and submitted to the Academy of Sciences, at Berlin, by M. Von Olfers, are the remains of the skull of a Dolphin, *(Dolphis Karstenii,)* converted into sandstone, which differs from all hitherto found, and appears to form the transition between *D. globiceps* and the allied species and the fossil genus *Ziphius.* It occurred near Bünde, in Westphalia. Vertebræ of *Balænoptera* were also communicated by Professor Becks; which occurred in a clay bed (Thonlager) between Bocholt and Oedin.—*Ann. Nat. Hist.* No. 29.

Fishes and Scales.—M. Atmuss has discovered an extensive deposit

of fossil fishes and scales in Livonia, hitherto undescribed. The form and dimensions of them are very extraordinary. The Academy of St. Petersburg have resolved to be at the expense of publishing a description of them.—*Athenæum*, No. 668.

Winged Fish.—Among the animals new to Palæontology, which were exhibited to the Geological Section of the British Association, and animadverted on by M. Agassiz, were, first, a Winged Fish so nearly resembling crustacea, as with great difficulty to be distinguished from an insect. It is about an inch or little more in length, and the wings are upon the shoulders, nearly in the same position as in the dragon-fly. The second was characterised by a curiously spotted head and tail. Both were found near Forres in the lower red sandstone, and were altogether new in genera and species. The middle formation was full of *Holoptychus* of a very large size, and other remains usually prevalent with them. The winged fish was named *Pterichthys Milleri*, in honour of its discoverer, Mr. Hugh Miller, a stonemason of Cromarty; and the other, which had been described by Dr. Malcolmson, was also a pterichthys. All belong to the same geological age, and it is expected that in a few years, between Cambrian and Russian specimens, we shall have the whole *Fauna* before us.

M. Agassiz, during last autumn, had an opportunity of examining the fossil remains in the Edinburgh College Museum, and put his hand upon two entirely new genera and eight species of the *Pterichthys*, or winged fish. Unlike the specimen exhibited at Glasgow, which resembled a butterfly, these are like beetles, with the wings of the flying-fish. The one genus is broader than the other: the length of each, between two and three inches. Here we have a most interesting addition to the *Fauna* of an elder world—the world before man was created; and as these wonderful resuscitations go on, we doubt not but that the *fifteen hundred extinct animals* already possessed by this indefatigable and enlightened geologist will soon be augmented to double that number.—*Literary Gazette*, No. 1242.

Lord Francis Egerton, on understanding that by purchasing the drawings of M. Agassiz's great work, *Poissons Fossiles*, he would enable that distinguished naturalist to extend his researches, has offered to give him £500 for them, and to leave them with him at Neufchatel as long as he requires them.

Bones of Fishes, Birds, and Mammalia, have been discovered by Mr. Graves in a limestone cliff at Eel Point, in Calder Island, 80 feet above the sea.—*Proc. Geol. Soc. June* 10.

Iguanodon. (?)—Mr. Mackason, of Hythe, announces the discovery, near the bottom of the green sand in the vicinity of that town, of portions of a large Saurian, supposed to be an Iguanodon.—*Ibid.*

Fishes.—Mr. Sligo has exhibited to the Wernerian Society a large slab of the Mussel-band ironstone, lying immediately over the coal at Avidie, N. B., and containing some interesting remains of ganoid fishes.

Elaterite.—Pelouze has ascertained that this substance, which occurs in La Vendée, has the same composition as Indian rubber, viz., $C_8 H_7$. In this country it is accompanied by a sort of gum resin, which is sometimes red, sometimes yellow, and even greenish; transparent, insoluble in water, and corresponds in its characters with amber.—*Athenæum*, No. 669.

Trees.—In cutting the new road leading to Norham bridge, on the north side of the Tweed, there have been discovered a number of Fossil Trees, which beautifully illustrate the formation of coal, from the remains of vegetable matter being, for the most part, incrusted with that substance, and some of it being of the purest kind. The roots of the trunk could not be perfectly traced, but the evident appearance of the lamina and branches completely established their character. The largest of the trunks are about 5 or 6 feet in diameter.—*Abridged from the Berwick Warder, July.*

Nondescript Vegetable.—Dr. R. Patterson has noticed to the Wernerian Society a Nondescript Fossil Vegetable, observed by him in the shale near Newhaven. It consists essentially of a cylindrical head or catkin, with two divisions. To this is attached a striated stem, with occasional enlargements on it. It approaches, in general appearance, to several living genera of plants, such as Typha, Equisetum, Piperomia, and Pothos; to the latter of which, however, it seems most closely allied. The genus Pothos is now entirely a tropical one; which circumstance affords additional evidence of the great similarity which existed between the plants which must have so luxuriantly flourished in this country at the period when the real strata were deposited, and those of tropical climates at the present day. Of this fossil only a single specimen had hitherto been found.—*Jameson's Journal*, No. 56.

BONE CAVES OF DEVON.

On March 25, was read to the Geographical Society, a communication "On the Bone Caves of Devonshire," by R. A. C. Austen, Esq., F.G.S. After noticing the two theories which have been proposed to account for the introduction of the remains of mammalia into caves—one, that the carcases were dragged in by hyænas or bears; the other, that the bones were washed in by diluvial action—Mr. Austen offers his own solution of the phenomena presented by the Devonshire caves, but without reference to any general explanation of those of other districts. With respect to the habits of hyænas, he quotes the following passage from Cuvier:—"Les hyènes se tiennent solitaires dans les parties montagneuses;" and he adds, least of all do they inhabit caves, nor have they the courage to attack any formidable animal, living on the putrid flesh and bones which they find in their nightly prowlings, and which they devour on the spot. M. Marcel de Serres is also quoted, to prove that the gluttony of the hyæna is only equalled by his cowardice. The lion, on the contrary, pursues living prey, prostrating it at one spring, and bearing it off to his lair, which African

travellers report to be chasms, caves, or over-hanging edges of rocks. On these grounds, Mr. Austen is induced to infer, that the bones found in the Devonshire caves are not the residue of the prey of hyænas, but of the lion, tiger, or other larger feline animals, teeth and remains of which occur in the Plymouth and Hutton caves, and in many others in different parts of Europe.—*Athenæum*, No. 650.

ANALYSIS OF FOSSIL BONES.

Von Bibra has published an analysis of Fossil Bones from Schrebheim, near Scheveinfurt. In these bones, the earth was entirely removed, so that they exhibited the same relations as are observed in the up-filling of crystals, and the so-called after crystals. The bones were imbedded in Keuper limestone, and afforded the following ingredients:—Sulphuric acid, 3.437; carbonic acid, 4.400: siliceous acid, 9.600; alumina, 63.400; lime, 3.589; magnesia, 0.294; ox. manganese, 5.954; fluor, 4.327; water, 5.00.—*Jameson's Journal*, No. 56.

MICROSCOPICAL EXAMINATION OF FOSSIL TEETH.

On Jan. 29, Mr. Owen communicated to the Microscopical Society a paper on the application of Microscopic examinations of the structure of Teeth to the determination of Fossil Remains.

The first example adduced was that of the Saurocephalus, an American fossil animal, which has been referred to the class of reptiles. After pointing out the distinctive characters of the microscopic texture of the teeth in reptiles and fishes, it was shown that the Saurocephalus, according to this test, unquestionably belonged to the latter class, and that it most clearly resembles Sphyræna among recent fishes, in its dental structure.

The second instance was the Basilosaurus of Dr. Harlan, which had been referred to the class Reptilia; and the double-fanged structure of its teeth had, on the strength of its supposed Saurian affinities, been adduced to weaken the arguments in favour of the mammiferous structure of certain fossils from the Stonesfield oolite. Mr. Owen, having described the microscopic character of the teeth of the Basilosaurus, shows that it deviates from the Saurian structure, in this respect, as widely as the Saurocephalus, but that the modification of its dental structure resembles most closely that of the cachalot and herbivorous Cetaceæ. Lastly, Mr. Owen alluded to the difference in the views entertained by Cuvier and M. de Blainville, as to the affinities of the Megatherium, which is referred by one to the family of the Sloths, and by the other to that of the Armadillos: after explaining the well-marked differences in the microscopic character of the dental structure in these two families of the so-called Edentata, Mr. Owen proceeded to describe the structure of the teeth of the megatherium, and to show that in its close resemblance to the dental structure of the sloths, it confirms the views of the great founder of the science of fossil remains.—*Abridged from Jameson's Journal*, No. 56.

NEW TISSUE IN FOSSIL WOOD.

On Oct. 21, a paper was read to the Microscopical Society, by Mr. Bowerbank, "On a new variety of Vascular Tissue found in Fossil Wood from the London Clay," of Herne Bay, in Kent. It is dicotyledonous, and the texture of the mass is very similar to Bovey Coal, but more carbonaceous. With a low power, the wood bears a close resemblance to the structure of beech. A thin section, when viewed as a transparent object, with a power of 100 linear, exhibits numerous large vessels, the majority of which are of that variety of annular vessels which has the annulations very much interrupted, and divided into numerous portions of various sizes.

Occasionally, large vessels are seen, thickly covered with minute dots, having a dark line passing through the centre of each at right angles to the axis of the vessel. The true nature of this singular appendage is best seen by a power of 800 or 1,000 linear, which exhibits the transverse line as consisting of two lines, separated from each other at their centres, but united together at either extremity. In most cases, their lines do not extend over the surface of more than one dot, and their united ends project slightly beyond its margin; but in a few instances, they extend over two, three, and even four dots, when the lines expand to the greatest degree over the centre of each of the dots, and approach each other slightly in the spaces between them. An almost precisely similar structure had been pointed out to the author by Mr. E. Quekett, in the recent wood of *Piper nigrum*.

Another remarkable appearance in the same fossil wood consists in certain of the vessels being occupied by numerous vesicular globules, which appeared to have been thickly floating between their parietes. When not in contact with each other, they are perfectly spherical and uncompressed, and in some cases are so numerous as to fill nearly the whole diameter of the vessel. These globules are very variable in size, and the author considers that the whole of them may be attributed to a more than ordinary development of globules of circulation, analogous to that observed in *Valisneria* and other plants. No analogous structure to this is observable in the recent wood of *Piper*.—*Annals; and Mag. Nat. Hist.*, No. 38.

SEMI-PETRIFIED TREE.

At a late meeting of the Mechanics' Institute, of New York, a member stated that he had seen a tree in Onondaga county, half in the water, and turned to stone, or petrified, and the remaining part unchanged. It is usually supposed that petrified wood, (so called,) is a pseudo-morphous formation; in other words, that the capillary tubes of the wood are first filled with the mineral in solution, which is gradually precipitated from the water: the woody fibres between are next decomposed, and pass away, leaving a new set of tubes, which, in their turn, fill with the mineral, and thus we have a *cast* of the wood, without one particle of the original remaining; although it resembles

it so closely in appearance as to be sometimes mistaken for it.—*American Repository of Arts; Mechanics' Magazine*, No. 883.

COAL IN SCOTLAND.

A SEAM of coal has been discovered in the county of Fife, on the lands of Cowdenheath, rented by Mr. Wright, of Edinburgh, which, for general purposes, is superior to any hitherto found in Scotland. It consists of alternate layers of splint and cherry of the finest quality; together with a foot of parrot or gas coal, on the bottom of the seam, which, for the quality and yield, is not to be surpassed. Besides possessing the caking quality of the English coal, it has the free burning quality of the Scotch, is free from dust and sulphur, and gives a very strong heat.—*Berwick Warder.*

BURNING COAL MINES.

ON March 15th, a remarkable conflagration broke out in the Coal Mines of Commentry, in the department of the Allier. It appears that this fire, which, for the last four and twenty years, has been silently smouldering in the bowels of the earth—revealing its existence by perpetual smoke, and occasional outbreaks of flame, which, however, had always been confined within the limits abandoned to its dominion – at length made its way through some breach into one of the vast galleries of these extensive workings; and there, meeting with the air-current so long denied it, spread through all the subterranean chambers and passages with a rapidity before which resistance became utterly powerless; showing itself at every crevice and outlet of the vast labyrinth, and flinging its points and columns of fire far up into the air, through all the shafts that led into the wide field of the rich deposit. Neither Vesuvius, nor any other eruption, (say the accounts,) can give a notion of the dreadful and sublime scene. It was, at length, extinguished by laying the ruins under water, which appears to have been a vast labour, executed with extraordinary promptitude. The nearest river flowed 38 metres beneath the coal-field. A minute survey of the ground was, however, made, and established the possibility of turning the course of a tributary stream, which flowed at a distance of 4,300 metres. The work was instantly commenced; the ground-formations for the bed of the deviation occupied forty-eight hours: and twice that interval of time sufficed to execute and arrange in their places certain wooden conduits, destined to traverse several intervening hollows. At length, the waters, so impatiently expected, arrived, pouring into the burning mine 2,000 cubic metres of water per day. All the subterranean works were thus placed under water; and a system of irrigation established on the burning mass, which not only extinguished the immediate conflagration, but that also which had been in operation for 24 years past.—*Selected and abridged from the Athenæum*, Nos. 649 and 652.

COINCIDENT EARTHQUAKES.

THE town of Zante, in the island of the same name, was ruined by a series of terrific shocks of Earthquake between Oct. 24 and Oct. 30; and on the 26th of that month, a shock was felt at Comrie, in Scotland. The distance between these localities is nearly 1,700 miles, or one-fifteenth part of the circumference of the globe. The bearing is north-west and south-east. The great earthquake of the 23rd October, 1839, was felt simultaneously at Comrie, in Piedmont, and at Reggio, in Calabria; that is, over a line coinciding with the above, and only a little shorter. If we prolong the line connecting Reggio and Comrie further northward, it strikes Mount Hecla, in Iceland, and may thus be said to have an active volcano at each extremity —Etna at the one, and Hecla at the other. Its length will be 2,300 miles, or one-eleventh part of the circumference of the globe.— *Scotsman.*

EARTHQUAKES IN CHINA.

M. BIOT has discovered, in the annals of the Chinese, historic evidences of two great deluges, the most recent of which they place as far back as the 23rd century before our era. These M. Biot undertakes to explain by the phenomena of Earthquakes, traces of which Humboldt has remarked in Central Asia. From the coincident direction of the axis of the Mexican Cordillera with that of the mountains of China, the author concludes the crust of the earth to be but little consolidated throughout the extent of that zone; and assumes the probability of simultaneous earthquakes in the two countries; whilst there is a striking analogy between their respective phenomena. The author has, with the aid of M. Stanislas Julien, translated all the descriptions of these earthquakes, eruptions, fissures, and lacerations of the ground, mountain-slips, and formations of lakes, in support of his opinions.— *Athenæum*, No. 663; *abridged.*

EARTHQUAKE AT MOUNT ARARAT.

THE Hôme Department, at St. Petersburg, has published a Report of an Earthquake at Mount Ararat, which is stated to be the first official and circumstantial account; all previous descriptions having been very defective and confused, and frequently contradictory. Of this Report, the annexed is the substance:—

"About sunset, on July 2, a violent Earthquake occurred in the Armenian province, which lasted nearly one minute. The village of Achturi, situated on the declivity of the Ararat, in the Surmanlinsk district, with the whole of its inhabitants, the more elevated cloister of St. Jacob, and the house of the former Sirdars, (governors,) were completely overwhelmed by the masses of earth, stone, and ice, which rushed down the mountain. Inundations of melted snow, mixed with mud, flowed over the neighbouring fields, totally covering them, and destroying all the grain and fruits within a circuit of more than ten wersts. In the Scharusk district also, at seven o'clock in the evening of the same day, no less than 3,137 houses, with all their subsidiary

buildings, were levelled to the ground by the earthquake, whereby 13 men, 20 women, and 253 head of cattle perished. The loss of property to the inhabitants of this district is estimated at 43,929 rubles. At the same moment, the shock was felt in the fortress of Shusha, and other parts of the Karabacha province, where it also lasted exactly a minute. The fortress sustained no damage; but in the province, one church and 169 inhabited houses were destroyed. The eastern wall of the ancient Armenian convent of Tatuosk gave way, along with the roof, from which the carved stones rolled down, and the towers were demolished. The rocks in the neighbourhood of the villages of Shingen sank down, by which an Armenian, two women, and a great number of cattle, were killed; immediately after, the whole of the road to the village was covered and closed up.

"In the Talusin Khanat, the town of Concoran and its neighbourhood; in Alexandropol, in Tiflis; and throughout the whole district of Surmanlinsk, shocks were daily observed from the 3rd to the 8th of July.

"On the 6th, a second downfal of Mount Ararat took place, in consequence of which, vast rocks, stupendous blocks of ice, and immense floods of water, rushed down, destroying, in a few minutes, every thing in their way. Great streams of the various substances thrown up extended over a surface of more than 20 wersts."

Caspian Sea.—On Feb. 7, a little before midnight, a Volcanic Eruption, accompanied by a subterraneous noise, which was heard at 20 miles distance, took place at the village of Baklichli, about ten miles from the town of Baku, on the Caspian Sea. The flames were visible till the morning, at about 25 miles distance. For two miles all round, clods of earth were thrown up; a dense, black smoke, which rose like an immense column, was driven like a thunder-cloud before the wind, and left behind it, for nearly 30 miles, a vast number of small hollow globules, resembling shot, composed of the matter burnt, mixed with sulphur. Next day, the flames ceased, but the ground was yet violently agitated, and small eruptions occurred from time to time. Lava flowed from several places, but in far less quantity than in 1830. After the eruption, the atmosphere, to a great distance all round, was impregnated with sulphur; and in many places, there were such broad clefts in the earth, that the persons did not venture to let the cattle feed there. —*Literary Gazette*, No. 1235.

Batavia.—A great eruption of the volcano called Gonteer, in Batavia, took place on the 22d of May, and several successive days. The result has been a vast enlargement of the crater, and the conversion of the mountain, previously covered half-way up with vegetation, into one mass of blackened and arid rocks.

EARTHQUAKE AT ZANTE.

On October 30, and three following days, there was experienced at Zante, a shock of Earthquake, which involved the loss of many lives, and a considerable destruction of property. A Correspondent of the

Times, (Jan. 8, 1841,) states: "The great shock must have been of 40 seconds' or a minute's duration. It may assist you in forming some conception of its violence, when I tell you that the piles of 8-inch shells on a mortar battery were overthrown and scattered about. The highest point in the Castle is an open plateau; this is rent by fissures 40 or 50 yards long; large portions of the parapet and loopholed wall have been overthrown, and the stone platform in a small bastion is broken up."

EARTHQUAKES IN SCOTLAND.

At a recent meeting of the Royal Society of Edinburgh, an interesting paper was read by David Milne, Esq, on Earthquakes felt in Scotland during the autumn and winter of 1839. The shocks were first perceived on Oct. 2, and their number from that date to April 13, 1840, was 145. From Oct. 3 to Nov. 2, no day passed without shocks; and on several days there were as many as twelve or fourteen. The shocks appeared to diminish in number and severity as the winter advanced; though, on April 7, there was a shock only exceeded in severity by the great one of October 23, felt at Comrie, about 10h. 14m. P.M. It was perceived in all the central and southern parts of Scotland; and extended, to the north, as far as Dingwall on the east coast, and Appin on the west. Mr. Milne then described the undulation of the earth's surface which produced the above shocks; showing the natural levels of the ground to have been altered, in some cases, to the amount of more than two degrees, and in the opinion of some intelligent eye-witnesses, four degrees. There appeared to have been two undulations, and certainly one consisting of an anterior swell and a posterior hollow, which caused houses, situated on soft or hollow ground, to rock like boats on the swell of the sea. The velocity of the undulation must have been immense, as it occurred throughout the whole country, to which it reached at one and the same instant. Houses situated on rock were not so sensibly affected; and the shock was, in all cases, felt more in the upper than in the lower flats. The shocks were transmitted to greater distances in the direction of E.N.E. from Comrie than in any other direction.

Mr. Milne attributed these phenomena to fractures, or ruptures, in the earth's crust at a great depth; which he considers a better explanation than the philosopher's hypothesis of the earth's crust floating on molten lava. The vibrations caused by these subterranean ruptures would rise vertically as well as obliquely upwards; and create, at some places, the sensation of the shock coming directly from below, and at others, of its moving forward along the surface. The cause of these ruptures, and their frequent occurrence near Comrie, was next adverted to; and some geological explanations were given, tending chiefly to show the earth's crust to be there intersected by great lines of fracture; that these lines were nearly parallel E.N.E.; and there had been frequently outbursts of igneous rocks in them. For a month before the commencement of the earthquakes, and for some time after they

were perceived, there had been, in Perthshire, an almost unprecedented quantity of rain; notwithstanding that it was observed of the Erne, the Airdle, and other streams near Stratherne, that they were not flooded, as might have been expected. The circumstance of these earthquakes being, in some way, connected with the rain, is rendered probable by the fact that, in former years, they had been almost always preceded by rainy weather; and it is known that if water percolated to the depth of one inch and a half into the earth's crust, it would, in consequence of the subterranean heat, generate steam, which might cause ruptures. The water might, in Perthshire, percolate into subterranean depths, by the numerous fissures abounding in it.—*Abridged from the Scottish Standard.*

Comrie.—A rather smart shock was felt here on the evening of Oct. 26, at a quarter to seven o'clock. The seismometers, or earthquake markers, were on this last occasion very sensibly affected. One of them, Mr. Milne's vertical force one, ranged 4° on its scale, which is about three-fourths of an inch from its zero, or point of rest. Another, the dip instrument, indicated the shock to have come upon it at an angle of 45° to the horizon, in the direction of W. by N. So that if the hill of Cluan be, as is here generally supposed to be the case, directly over the focus of these shocks, this would give a depth to it under that hill, within the bowels of the earth, of about two miles. The barometer and thermometer were not affected. The former stood at 29⅝ inches, the other at 48° Fahrenheit. The night was calm, and accompanied with a gentle drizzle. This is the third shock that was sensibly felt within the current month (October).—*Scotch paper.*

LAND OR MOUNTAIN-SLIP IN FRANCE.

NEAR Salins, in the district of the Jura, on the night of the 29th-30th of January, a mountain, called the Cernans, came down in mass on the plain by which it was surrounded, and a portion of the royal road from Dijon to Portalier sunk with this great land-slip, to a depth of more than 50 metres. During the day of the 30th, a fresh mass of earth and rock detached itself, and slid down with a motion sufficiently rapid to be distinctly perceived at a great distance by the naked eye,—displacing in its fall an additional portion of the road. By some, it was attributed to cuttings made at the foot of the mountain for the formation of a new road; others were of opinion that a fountain which ceased to play, upwards of five-and-twenty years ago, must have taken a subterranean direction, and mined out a portion of the mountain. Happily, no lives have been lost.—*Athenæum*, No. 643.

LAND-SLIP IN DEVON.

A POPULAR description of this phenomenon will be found in the *Year-book of Facts*, 1840, p. 246. The following corrective account was read to the Ashmolean Society, on March 2, by the President, Dr. Buckland.

This sinking of the land and elevation of the bottom of the sea, at Axmouth, has erroneously been attributed to an earthquake. Dr. Buckland first defined a true earthquake, as understood by Von Buch, Humboldt, &c. It is a vibratory or oscillatory motion of the land, propagated either perpendicularly or laterally. The effects of earthquakes extend to greater distances, according as the disturbing forces are more deeply seated. The phenomenon of a gradual subsidence, or land-slip, which occurred at Axmouth during two days, viz. the 25th and 24th of December, 1839, bears no analogy to the oscillatory motions of an earthquake, and proceeded from an entirely different cause. The cliffs on that part of the coast consist of strata of chalk and cherty sandstone, resting on a thick bed of loose sand or fox-mould, beneath which is a series of beds of lias clay, impervious to water.—Owing to the long continuance of wet weather during the autumn of 1839, the lower region of the fox-mould became so highly saturated with water, as to be reduced to the state of a semi-fluid quicksand. The coast of East Devon, from Axmouth to near Lyme Regis, presents vertical cliffs of chalk, about 500 feet above the level of the sea, between which cliffs and the beach, a space, varying from a quarter to half a mile in breadth, is occupied by ruinous fallen masses of chalk and cherty sandstone, forming an undercliff similar to that on the south coast of the Isle of Wight. In both cases, the cause of this ruinous condition has been, partly, the gradual undermining by land-springs of portions of the loose sand, causing the superincumbent strata of sandstone and chalk to founder or subside into the cavities produced by the gradual removal of the sand immediately beneath; and partly, a more general movement, or sliding forwards and downwards of large portions of the undercliff in seasons when, as during the autumn of 1839, the subjacent sand has been reduced to a semi-fluid state by the accumulation of water from excessive rains.

The subsidence or land-slip at Axmouth commenced on the night of the 24th of December, 1839; and during the following day, slight movements of the undercliff, producing small chasms, were noticed by persons walking over it: a few cracks also were observed in the fields above, adjacent to the high cliff. About midnight, on the 25th, the inhabitants of two cottages on the undercliff were awakened by loud sounds, produced by the grinding of slowly moving masses of the adjacent rocks: they found the floors of their houses rising upwards towards the ceiling, and made their escape with difficulty. The walls were rent, and one cottage was, in the course of a few hours, thrown down. About the same time, two men of the Coast Guard, on duty on the beach, observed a huge reef of rocks gradually rising out of the sea, at no great distance from the shore, which continued to move slowly upwards during the whole of the next day, the 26th, until it had formed a reef or breakwater nearly half a mile long, and varying from 10 to more than 40 feet in height, betwixt which and the shore was inclosed a basin of salt water about five acres in extent, and in some places 25 feet deep. The upper portion of this reef was composed of beds of cherty sandstone, dipping rapidly towards the land, and presenting a steep escarpment towards the sea: the lower portion of this

escarpment was composed of sandy clay and sandstone, belonging to the lower region of the green sand or fox-mould formation, the perishable nature of which will probably cause the entire reef to disappear from the action of the waves. The surface of the reef was covered with marine animals and plants. The men who witnessed this phenomenon had considerable difficulty in escaping over the adjacent cliffs, which were already becoming intersected by chasms. About 50 acres more of the coast were severed from the main land in the course of the same day. Parts of the subsided mass present a most picturesque appearance. On some portions, which remain horizontal, crops of wheat and turnips are still visible on inaccessible situations, varying from 130 to 200 feet in height, as well as the remains of the road and hedges formerly continuous with those still remaining on the adjacent table lands.

It is important to observe that the upward movement of the reef from the bottom of the sea began and terminated simultaneously with the downward movement of the subsiding land. The weight of the latter pressing on the semi-fluid portion of the subjacent fox-mould must have produced, throughout this fluid, a general hydrostatic pressure, tending to force upwards the superincumbent stratum of cherty sandstone, wherever the line of least resistance to the hydrostatic pressure might be; and, as this superstratum is covered with heavy masses of chalk and other detritus throughout the whole undercliff, whilst only a few feet of water overlie the submarine portions of it which were near the shore, the line of the shallow water was that where the least resistance was offered to the upward pressure of the quicksand. Here, therefore, the rupture took place, forcing upwards a mass of cherty sandstone, nearly equal in bulk to that of the chalk and sandstone, which sunk into the gulf at the margin of the adjacent high cliff. Dr. Buckland enumerated a list of similar landslips which have occurred on various parts of the coast, as well as in the interior of the kingdom, where the physical condition of the strata have been found to be analogous to those at Axmouth.

Mr. Lyell observes upon this phenomenon: "During the late land-slip near Axmouth, on Dec. 24, 1839, a lateral movement took place, by which masses of chalk and green sand, which had been undermined, were forced more than 40 feet in a seaward direction, and thrown into great confusion, while the subjacent line was not disturbed. The pressure, moreover, of the descending rocks urged the neighbouring strata, extending beneath the shingle of the shore, by their state of unnatural condensation, to burst upwards in a line parallel to the coast, by which means an elevated ridge, more than a mile in length, and rising more than 40 feet, has been made to form an extended reef in front of the present range of cliffs. This ridge, when it first rose, was covered by a confined assemblage of broken strata and immense blocks of rock, invested with sea-weed and coralines, and scattered over with shells, star-fish, and other productions of the deep. —Paper *On the Boulder Formation, and Fresh-water Deposits of Eastern Norfolk, Philos. Mag. No.* 104.

Astronomical and Meteorological Phenomena.

NEW COMETS IN 1840.

THIS year has been remarkable for Comets.—On Jan. 8, at 5 A.M. a Comet was observed, for the first time, at Paris. On the 14th, it was in the tail of the Serpent, near the star Eta: right ascension, 18h. 22m.; south declension, 4m. It was visible to the naked eye; but, as it did not rise till 4½ A.M. it soon became lost to sight by the sun's rays.

The elements of the orbit of the Comet discovered on Jan. 25, at Berlin, by M. Galle, appear to be very similar to those of the comet of 1784, which was observed by Mechain; and, in fact, if it be supposed that this astronomer made a mistake in noting the descending nodus of his comet for the ascending one, it may be said that their elements are indentical, and they are one and the same body.

The following observation of Galle's Comet was made at Geneva, on Feb. 23:—Sidereal time, 6h. 11m. 32s. 10; right ascension, 0h. 53m. 22s.; north declination, 40° 15′ 52″. The right ascension of this Comet increases daily by 4m. 8s., and its north declination diminishes by 58′ daily. It has no tail, and scarcely any perceptible nucleus. It is invisible to the naked eye. Another observation, on Feb. 21, at Padua, 9h. 45m. 54s.; right ascension, 0h. 44m. 6s.; north declination, 41° 55′; by Professor Santini, director of the Observatory of Padua.

On October 27, M. Bremicher, an astronomer, of Berlin, saw a new Comet; which M. Langlier observed at Paris, on the 7th of Nov., in the group of the Dragon. It emitted but a very feeble light, but its diameter, which exceeded two minutes, announced very uncommon dimensions. This comet was entirely telescopic, and quite invisible to the naked eye. It was extremely difficult to discern it even with an excellent night-glass.

SPOTS ON THE SUN'S DISC.

ON Dec. 6, an astronomer of Reimes, at 9 o'clock, 59m. 26s., A.M., observed on the Sun's disc ten Spots, several of which were covered with a nebulous appearance. Of the three towards the south, the largest contained twice the diameter of the earth. Of the three at the east, one had the form of a reversed pyramid. Of the four at the west, one had the last mentioned form; the fourth resembled the bow of a circle.—*Dec.* 12.

BLUE SUN.

COLONEL REID has communicated to the British Association an interesting account of Blue Sun, at Bermuda, bearing date 17th

August 1839, and has requested an explanation of the singular phenomenon familiar to all at Bermuda—white objects appearing blue, and all others taking a similar hue. After stating the fact, which he had had, since at Bermuda, a good opportunity of observing, viz. that he revolutions of a water-spout near the surface were like the hands of a watch, Colonel Reid observed that Dr. Hardy, the present Collector of Customs, when recently at sea fifteen miles east of Bermuda, a hurricane raging over St. Vincent, saw all objects of a greenish colour. But the most remarkable blue sun occurred in 1831, which Dr. Hardy described. The night previous to the 3d of August, 1831, huge masses of clouds had collected, threatening a prodigious fall of rain, but no indications of wind or of a storm. During the night, the thunder and lightning was severe; in early morning, some time after he had risen, the light became so dim, and every object in the room looked so blue, that he apprehended a sudden failure of sight. He communicated this to his family, but they also saw every thing of the same blue colour. Dr. Hardy then looked out;—the day was tranquil, the purely white sails of a vessel near were, to the sight, a deep blue; and the sea, to the coast of America, looked yellow.

Sir David Brewster was not aware that the fact, although frequently observed, had ever been accounted for. The phenomenon occurs when halos are formed, and is produced in a way analogous to the colours of mixed plates, which are caused by fringes of rays of light, portions of different degrees of refrangibility. These colours, so brilliant, may be produced by a lather of white soap between two plates of glass; the bubbles will be small vesicles, or cavities of air, through which the light will pass, and which afford different media of different degrees of refrangibility; therefore interference and therefore colour. It is easy to conceive that vesicular globules exist in the atmosphere, and consequently, that light, passing through different media, will, and does, produce the phenomena of mixed plates.

Professor Forbes noticed that the communication did not state whether the disc of the sun was visible, and of a blue colour. This fact, however, is well known; and was last observed, he believed, by M. Arago, at Algiers. The explanation given by Sir D. Brewster had been already suggested by M. Babinet,* and when two such authorities agreed he thought there was no doubt but that the cause was clearly established.—*Literary Gazette*, No. 1237.

LIGHT OF ORION.

On Jan. 10, Sir John F. Herschel communicated to the Astronomical Society a paper "On the Variability and Periodic Nature of the Star and *Orionis*," which, up to this time, had remained unnoticed by astronomers. We have not space for details; but, appended to a note of Jan. 2, is a statement that "the difference between *Orion* and *Aldebaran* is evidently and rapidly on the decrease. The stars are all

* For some valuable Observations by M. Babinet, on Blue Sun, see Year-book of Facts, 1840, p. 267.

high, at nearly equal altitudes, and admirably arranged for comparison."

Jan. 7, 1840. "*Procyon*, *Orion*, *Aldebaran*, form a succession by nearly equal steps."—"Upon the whole, I think it may be stated, that in the interval from November 26 to the present date (January 7), *Orion* has sustained a loss of nearly half its light. It may easily be supposed that a diminution, thus evidently still in rapid progress, will, in no long time, carry down the rank of this star below that of *Aldebaran*, and that the confirmation or disappointment of this expectation is awaited with no small interest."

PARALLAX OF THE FIXED STARS.

On April 10, before the Astronomical Society, a paper by Mr. Main, "On the present state of our knowledge of the Parallax of the Fixed Stars," was resumed and concluded. The object of this memoir was a review of the parallax of 61 *Cygni*, recently obtained by Professor Bessel*. The author recommends to the notice of astronomers a very complete historical summary of astronomy, as connected with this subject, by Fockins, (which was printed at Leyden in 1835), entitled *Commentatio Astronomica de Annuâ Stellarum Parallaxi*, which, he remarks, very materially assisted him in the prosecution of the historical part of his work. The author proposes the four following divisions of his report:—1. Abstracts of theoretical papers which have appeared on the subject of annual parallax. 2. A statement of the results of observations which have been made since the time of Bradley for the purpose of detecting parallax. 3. A review of the results of contemporaneous astronomers on the subject. 4. A discussion of Bessel's observations and results. With respect to the latter, the author concludes, not only that a real parallax has been detected, but that its amount is very approximately given in Bessel's investigation; who is enabled, by repeating the same process, to diminish at pleasure the residual errors of the determination. This feature separates completely the present from all former attempts; in some few of which an amount, rather greater than the limiting probable errors, would seem to announce a parallax, of which the evidence is yet so slight as to leave the mind quite unsatisfied of its existence; while the uncertainty of its amount, (supposing its existence to be proved,) prevents its application to ulterior objects in sidereal astronomy. To the memoir are annexed two appendices, the first of which contains the investigation of formulæ for computing the co-efficients of the constant of parallax in the two cases; and also for finding the variation in the angle of position of two stars very near each other, one of which is effected by parallax. The second contains a translation of the most important parts of Bessel's description of his Heliometer.—From the *Astronomische Nachrichten*, Vol. VIII. No. 189.

An extract was then read from a letter from Prof. Bessel, stating that the observations on 61 *Cygni* had been continued through the last

* A brief notice of Professor Bessel's "magnificent conquest" will be found in the *Year-Book of Facts*, 1839, p. 247.

year to the end of March, 1840; and that the most probable value of the parallax resulting from the measured distances of the double star from each of the two stars of comparison is 0″.3483; subject to a small indeterminate correction, depending on the effects of temperature on the micrometer-screw. This result is greater by 0″.0347 than was found from the first series of observations. It results from this determination, that the distance of the star 61 *Cygni* from the sun is 592,200 times the mean radius of the earth's orbit; a distance which light would require 9¼ years to pass through.—*Athenæum*, No. 659.

SCINTILLATION OF STARS.

On January 20, M. Arago read to the Academy of Sciences, at Paris, a long paper "On the Causes of the Scintillation of Stars," which, he remarked, are divisible partly into a change in the intensity of a star's light, and partly in a change in the colour of that light. The former fact has been noticed by Galileo. Kepler first observed the change of colour. M. Arago explains the phenomenon on the principle of interferences, and compares the different strata of the atmosphere, through which the stars pass, to lenses of different densities and refracting powers, which will, of course, greatly distend and change the composition of the light received by the eye of the observer. It is known that in some parts of the world, as in Persia, Asia Minor, &c., the stars do not scintillate. M. Arago also states that, under certain circumstances, the sun may be seen to scintillate.—*Literary Gazette*, No. 1202.

AUGUST ASTEROIDS.

As in the *Year-Books* 1839 and 1840, we give notes of the return of these Meteors in the past year.

The pupils at the Observatory, at Paris carefully watched the number of meteors during the night of the 9th and 10th of August. Until midnight, the number did not exceed eighteen per hour, or nearly a mean of what are observed on ordinary nights; but at three o'clock, M. Mauvais counted thirty-five in one hour. The greater proportion fell almost parallel to the Milky Way, which at this time extended from the zenith towards the west, a little inclined to the south.—*Athenæum*, No. 670.

M. Arago has communicated to the Academy of Sciences, at Paris, a paper from M. Errmann, of Berlin, "On the Showers of Shooting Stars, observable about the 10th of August, and 13th of November, every year." He considers them as asteroidic bodies revolving round the sun, and interposing themselves again every year in the first fortnight of February and May, between the earth and the sun. He infers this to explain why, at those later periods, the sun's light is often peculiarly enfeebled, and the temperature of the globe diminished; a phenomenon, which, he states, is annually observable between the 7th and 12th of February, and 11th and 13th of May.—*Literary Gazette*, No. 1202.

The Rev. D. Parker, of Canton, observed the fall of 64 meteors

between 10 P.M., and 11h. 45m. P.M. of the 10th of August, 1839; and on August 11, between 8h. 15m. P.M., and 4½ A.M., of the 12th, he counted 404 meteors, or falling stars. This appears to countenance the opinion of Mr. Henrick, that an annual fall of meteors occurs in August as well as in November; a circumstance which was observed some years ago by Professor Olmsted, of New Haven.

On March 5, a paper, by Sir F. Palgrave, was read to the Royal Society, on Shooting Stars; referring chiefly to the two remarkable periods in the tenth and twelfth centuries, the first in April, the other in August. In both these, the stars were seen to fall like rain! One chronicle recorded that the stars were driven, like sand, before the wind.

METEORITE AT THE CAPE OF GOOD HOPE.

On March 5th, were read to the Royal Society, "Further particulars of the Fall of the Cold Bokkeveld Meteorite," by Thomas Maclear, Esq. F.R.S.; containing Reports, supported by affidavits, of the circumstances attending the fall of a meteoric mass,* in a valley near the Cape of Good Hope. The attention of the witnesses had been excited by a loud explosion which took place in the air, previous to the descent of the aerolite, and which was attended by a blue stream of smoke, extending from north to west. Some of the fragments seen to fall, and which penetrated into the earth, were picked up by witnesses. One of them falling on grass caused it to smoke; and was too hot to admit of being touched. The mass which was sent to England by H. M. S. Scout, weighed, when first picked up, four pounds.

METEOR IN THE CARACCAS.

On the night of May 23d, a brilliant Meteor was seen in Venezuela, bearing an extraordinary resemblance to the aurora borealis. At 10 o'clock P.M., a luminous band, stretching towards the east, and broader at the opposite quarter, girded the horizon. The crests of the Cordilleras, which surround and enclose the valley on all sides, appeared correctly depicted on the clear atmosphere illumined by the meteor; and even the tops of such of the trees as rose above the walls of the houses, were exhibited in their true forms. Meanwhile, the sky was cloudy, and only a star of the first magnitude appeared at short intervals. The light, though not of equal intensity throughout the whole extent of the phenomenon, never resembled those flashes of lightning without detonation which occur in this climate during the summer months. The most brilliant portion became occasionally agitated, forming apparently a parabola, the vertex of which, only a little above the horizon, departed 76 degrees from the magnetic meridian towards the west—a circumstance which has the more claim to attention, inasmuch as in the auroræ borealis hitherto known, the point of convergence of the numerous rays is precisely that to which a magnetized needle, freely suspended by its centre of

* See a notice of this phenomenon, Year-book of Facts, 1840, p. 271.

gravity, points. An opaque column, which appeared and disappeared with the undulations of the meteor, or whatever might be the nature of that ocean of flame, glided rapidly, now to the left, then to the right, but without ever transpassing the horns of the curve. If the light of the meteor sometimes became so faint as to induce belief that it was about to disappear, it would suddenly revive in all its brilliancy, and give a repetition of the same effects. Twice it assumed a delicate purple tint, which also happens when electricity is propagated through a highly rarified medium. Hence the great elevation of the phenomenon may be conjectured. Half an hour before its final disappearance, five brilliant exhalations, which issued from the vertex of the parabola, with branches whirling upwards, imparted an astonishing character to the spectacle, and added to its splendour. At half-past 12 complete obscurity prevailed.—*Abridged from the Polytechnic Journal;* in which the writer hesitates to class this phenomenon with the Northern Lights, on account of its not having affected the magnetic needle. It is then asked: "But has not M. Arago observed that the same aurora which suddenly changes the direction of one needle leaves another, situated at a short distance, immoveable? All this only proves that the real cause of the phenomenon is not yet thoroughly known, though all naturalists are of opinion that it is electrical."

AURORA BOREALIS IN SCOTLAND.

On November 17th, between 7 and 8 P.M., an interesting appearance was observed in the sky over Comrie. From a semicircular black cloud on the verge of the western horizon, at the N.W. by W., all the other clouds in view spun out into long dark streaks, diverging like spokes from the nave of a wheel; and after extending into almost unbroken lines over the whole sky, they again converged into an exactly similar form, on another small black semicircular cloud in the opposite point of the horizon. At each focus, between the spokes, the light of the Aurora Borealis was very distinct. The western focus was, at first, very brilliant, during which time the other focus was more faint; and then the relative brightness of the two ends was entirely reversed for about half an hour, after which the clouds dispersed into their usual amorphous groups over the sky,

The above phenomenon is stated by its observer, to establish, at least, two points in meteorology. 1st. That the meridional lines of clouds often observed in the day-time extending across the heavens from north to south, as well as other directions, without, of course, any visible display of the Aurora, are, nevertheless, the effect of this electrical or magnetic influence, and not, as some have supposed, of currents in the air. 2nd. That the height at which the Aurora plays may coincide with, or extend to, that of the clouds in the atmosphere; although, at other times, its stage appears to be much more elevated. The writer of this note, some years previously, had an opportunity of calculating the altitude of the apex of a splendid auroral dome, consisting entirely of lights of various hues, that then appeared near the

zenith. The calculation was made from simultaneous observations, taken at Stirling and Comrie, and gave the height at 112 miles above the surface of the earth.—*Abridged from the Scotsman*, Nov. 21st.

HERSCHEL'S TELESCOPES.

On January 1st, the old and celebrated Telescope, constructed by Sir William Herschel at Slough, was consigned by his son, Sir John Herschel, to perpetual rest. The metal tube of the instrument, with its metallic mirror, has been preserved, and formed into a kind of monument in honour of the old telescope. All the woodwork, and whatever was liable to prompt decay, has been removed. The tube, therefore, was placed horizontally, and in the meridian line, upon pillars of brick in the midst of the circle of brickwork, on which the scaffolding for managing the telescope had formerly been erected, and within which the ground is now planted with shrubs. The reflector of the telescope was brightly polished for the occasion; and at noon precisely, on January 1st, the commencement of the astronomical year, the ceremony was commenced; which being over, the extremity of the tube was fastened up.

Among the presents announced at the meeting of the Astronomical Society, on May 8, was a seven-feet Newtonian Reflecting Telescope, the work of the late Sir William Herschel, and given by him to his sister, Miss Caroline Herschel; in whose name, and that of the President, (Sir John Herschel,) it was presented as above.

HEIGHT OF CLOUDS.

The altitude of Clouds in the South Sea, under the influence of the trade winds, was found, by the officers of the *Venus*, to be between 900 and 1,400 mètres (2,952 to 4,593 feet.)—*Athenæum*, No. 687.

THEORY OF STORMS.

Mr. Espy has communicated to the British Association a paper "On the Theory of Storms," the reading of which occupied nearly two hours. His theory was, that during storms the wind blew from all sides towards a centre, whether the centre of a circle or a square. He went into a great many instances of storms which had happened at particular seasons; and from facts ascertained as to the direction of the winds at various places around the space in which the storm prevailed, he shewed that the facts confirmed his theory. For instance, from the storm on the 6th Jan. 1839, he had prepared on the map an illustration of his theory. The storm began at Liverpool from 10 to 11 o'clock P.M. on that evening, and he had written to various places to ascertain the direction of the wind between 10 and 12 o'clock P.M. At the north-west of Scotland, near Cape Wrath, the wind was N.W. and it was the same all over the west of Scotland. In Ireland, at the same hours, it was W. and S.W. In the south-west of England, it was S.W. In the south-east of England, at the same hours, S.S.E; and in some places direct S.E.; at Birmingham, a little E. of S.; at Leeds and Manchester, S. of E.; at Liverpool at ten, S.S.E.; and before twelve, S.W. nearly. Thus, were

a line drawn from the north-east of Scotland to the south-west of Ireland, on one side of the line the wind would be found to have blown from the N.W. and on the other from the S.E. Mr. Espy then referred to other storms here, in the West Indies, and in America, which went to prove the same theory. The principles upon which it is founded are nearly these. The equilibrium of air may become unstable by the heat or the moisture below. Ascending columns or currents of air are thus formed, which, as they ascend, are subject to less pressure, and expand; this expansion producing 1¼° of cold for every hundred yards of ascent, while the dew-point falls only ¼° for the same space. Clouds will begin to form when the column of air rises, as many hundreds of yards as the dew-point is below the air in degrees. When the vapour condenses, it will give out the latent caloric into the air, which will prevent the ascending air from cooling more than half as much as it would otherwise have done on its farther ascent. Thus, the higher the column of air rises, the warmer it will be when compared with the air on the outside of the cloud at the same height. For every degree that the cloud is warmer, it will be a certain amount lighter than air at zero, and thus under the cloud the barometer will fall; and the air will run in under the cloud and upwards, with a velocity of upwards of 240 feet a second.

After a long account of his theory of the formation of clouds, Mr. Espy described the effects of the tornado, which he held to be additional evidence in favour of the theory. Sir D. Brewster had received a letter from Colonel Reid, from which it appeared that fire and water-spouts had been examined carefully with the telescope, in all of which there seemed to be a revolution of the particles of water in the manner of the hands of a watch, from left to right. Mr. Espy, in reply, however, showed that all bodies taken up on the right-hand of the centre of the path of the tornado must, from the laws of dynamics, go up in a spiral form from right to left; while those taken up on the left-hand of the path must move in a spiral upwards, from left to right; and that, consequently, one person might see the tornado whirl in one direction, and another in the other, according to the uniform testimony of the witnesses, along the whole tract of the tornado.—*Literary Gazette*, No. 1238.

The discussion which followed, greatly exceeds our limits: in the *Athenæum* Report it occupies eleven columns, including a Map showing the course of the wind in Great Britain, on Jan. 6, 1839. The facts adduced by Mr. Espy, in seventeen storms, within the last five years, do not, he states, present one exception to the general rule; yet they are opposed to those observed by others. In the case of water-spouts, the explicit and distinct observation of a rotatory motion, by so able and accurate an observer as Col. Reid, is considered to be worth a thousand *inferences from facts*, in which light Sir D. Brewster regards Mr. Espy's "observations."*

By a note in *Jameson's Journal*, No. 58, it appears that Mr. Espy's Theory of Atmospherical Phenomena,—the leading feature of

* A Series of interesting Abstracts of the Researches of Colonel Reid, Mr. Espy, Mr. Redfield, and others, on "The Law of Storms," will be found in the Year-book of Facts, 1839, p. 251-255.

which is the fall of temperature which occurs in the ascending current of air,—has been claimed by Mr. Meikle, of Edinburgh; who, in the *London Quarterly Journal of Science*, April, 1829, and in the article Hygrometry, in the *Encyclopædia Britannica*, vol xii. p. 132, has distinctly laid down the same theory in detail, and accompanied with various calculations and illustrations, which show how it will satisfactorily account, not only for the production of clouds, mountain caps, rain, snow, &c., but also, thunder, lightning, and water-spouts, if not some of the phenomena of volcanoes, and the northern lights.

CURRENTS IN THE ATMOSPHERE.

On May 4, M. Peltier communicated to the Academy of Sciences, at Paris, the results of some experiments during the calm hot days of April last, which he had made by means of a kite with a copper wire 400 metres in length, an electroscope, and a multiplier of 3000 turns. It was only at a height of about 40 metres that the multiplier began to give signs of a positive current: above 100 metres, the current increased rapidly in power, and once carried the needle round to 90°. The results were uniform while the sky continued unclouded; but the intervention of clouds caused a negative zone at from 50 to 70 metres in elevation, above which a positive current was again found.—*Literary Gazette*, No. 1217.

EFFECT OF WINDS UPON THE ATMOSPHERE.

The following laws have been deduced from extended experiments by Kamtz and Dove. 1. The barometer falls under the influence of the east, south-east, and south winds; the descent changes to ascent by the south-west wind; rises by the west, north-west and north winds; the ascent changes to descent by the north-east wind. This law is deduced from observations, made at Paris four times a day, at first for five years, then for ten years, 1816-25. 2. The thermometer rises by the east, south-east, and south-winds; the ascent changes to descent by the south-west wind; falls by the west, north-west and north; the descent changes to ascent by the north-east wind. This and the following are believed to be based upon observations made at Paris and London, and have been confirmed by observations of Kamtz himself during four years. 3. The elasticity of aqueous vapour is increased by the east, south-east, and south winds; its increase changes to decrease by the south-west wind; it decreases by the west, north-east, and north winds, and its decrease changes to increase by the north-east wind. 4. The humidity of the atmosphere decreases relatively from the west wind, passing by the north to the east; and increases, on the contrary, from the east by the south to the west.—*Athenæum*, No. 685.

WATER-SPOUT IN IRELAND.

The Rev. Dr. Dickinson has described to the Irish Academy, a remarkable water-spout, which he had observed at Killiney during the summer of 1839. Towards the end of the month of July, about 10 A.M., while standing on the shore of the bay of Killiney, his attention was directed to a water-spout, distant about a quarter of a mile from

the land. It was not similar in form to the representations of water-spouts usually given, but was shaped like a double syphon, the whole being suspended at a considerable elevation in the air; the longer end of the syphon reached towards the sea, and appeared to approach it nearer and nearer, till, at length, its waters were distinctly seen rushing into the deep. The loop gradually lowered, as if sinking and lengthening by its own weight, while the upper part of the syphon seemed not to lose in elevation. At length, the loop burst, and there were three streams of water pouring into the sea, two of those streams still continuing united by the arch at the top. The breadth of these streams gradually diminished till they became invisible, but their length seemed undiminished as long as they were at all seen. The quantity of water poured down must have been very considerable, from the bubbling observed in the sea.—*Athenæum*, No. 646.

SHIP STRUCK BY LIGHTNING.

On August 22, in lat. 42°, long. 55° 10′, at half-past 5, A.M., the bark *Underwood* was struck by lightning, accompanied by a tremendous report. It shivered the royal mainmast, split the maintop-mast head cap, and took a piece out of the mast; sent the links of the chain maintop-sail-tie in pieces, then burst in the maintop, and destroyed two maintop-gallant studding sails, sprung mainmast head, and split half the cheek off. Came down topsail sheets, and burst again in the pump cistern, where it had been attracted by the standards of the pumps; one of the pumps had a large piece knocked off, through which the lightning made its way into the hold; and, as it subsequently proved, passed out through the ship's bottom. In this were found two holes, one under each pump, with which the vessel had completed her voyage, (upwards of 2,000 miles,) without any one on board suspecting the extent of the danger.—*Abridged from the Times, Sept.* 23.

SNOW IN JULY.

On July 9, from 11 till 2 o'clock, there was a tremendous hailstorm, with heavy peals of thunder, at Ellingham, Northumberland; when the Snow lay above two inches thick! an unprecedented occurrence in recollection, at this time of the year.

"FROST-BOW" IN RUTLAND.

On Nov. 25, at 9½ A.M., the singular phenomenon of a solar arc, or Frost-bow, was observed in that part of the sky where a rainbow would naturally appear, although no rain was falling at the time; and the arch was much broader and fainter than a rainbow, of a whitish hue, and more distinct towards the horizon than the vertex; the morning was foggy, at the temperature 31°. Such phenomena are not frequent, and when they have been observed have usually preceded very frosty weather. One was observed a few days before the commencement of the great frost of 1739-40. Another was seen during the frost, both in this country and in Russia, as appears from the account

of them in the 19th volume of the *Gentleman's Magazine*. A similar bow to the above was observed in Rutland, Jan. 5, 1757, about noon, in a very frosty season.—*Stamford Mercury*.

RAIN IN GREAT BRITAIN.

On April 30, were read to the Royal Society, "A few Remarks on a Rain-table and Map," by Mr. Atkinson, communicated by Dr. Roget. The observations contained in this paper were taken at various places in England and Scotland; Derby, for instance, and Elgin, Bedford, Birmingham, Carlisle, Keswick, Hereford, Norwich, Swansea, &c. The author only found anything like uniformity in the quantity of rain falling in that locality called "the back-bone of England." He adds, that mostly all our rain comes from the Atlantic. In some places, the fall of rain in a year was 67 inches; in others, 54, 30, &c.; at Carlisle it was thrice as much as in some other places, and at Keswick it was twice as much; at Hereford it was 27 inches in a year; at Birmingham, 26; at Bedford and Norwich, 25 inches each: but this acquiescence cannot be accounted for.

WET SUMMER OF 1839.

On February 20, Mr. Luke Howard read to the Royal Society, some observations "On the Wet Summer of 1839," made at Ackworth, in Yorkshire; and the following are his results, with regard to the mean temperature and the depth of rain, in each month, during 1839:—

	Mean temperature.	Rain in inches.		Mean temperature.	Rain in inches.
Jan.	37.04°	1.13	July,	59.30°	5.13
Feb.	39.64	2.14	August,	58.09	2.94
March,	39.08	3.21	Sept.	54.49	3.43
April,	44.09	0.58	Oct.	48.39	3.40
May,	49.94	0.38	Nov.	43.14	4.54
June,	56.35	4.89	Dec.	37.29	1.85

Mean temperature of the year, 47.24°.
Total depth of rain, in 1839, 33.62 inches.

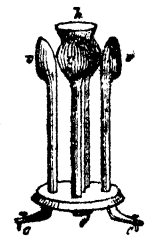
He states that the climatic mean temperature of the place is about 47°, and the mean annual depth of rain about 26 inches. The excess of rain during the year 1839, was, therefore, very great. The author describes the effect of the hurricane of the 7th of January, and follows the changes of the weather during the remainder of the year.—*Athenæum*, No. 648.

NEW RAIN EXPERIMENTS.

Prof. Phillips has reported to the British Association a number of Experiments made by him on Rain-gauges. To determine the difference between gauges at higher and lower altitudes, he placed one gauge on the ground, and completely exposed others at the heights of 3, 6, and 12 feet; and after a trial of four months, he found the results to be in the following proportions: the highest, 8·206; the next, 8·249; the next, 8·314; and the lowest, 8·408; thus showing the greatest quantity of rain to have fallen nearest the ground; which

Prof. Forbes attributes to the enlargement of the rain-drop by condensation from the heated air of the earth's surface.

Prof. Phillips then described a new construction of Rain-gauge, for determining the direction in which rain comes, and the angle of inclination at which it descends. For this purpose, a compound gauge is constructed, having five equal receiving funnels and tubes; one with a vertical tube and horizontal aperture, the other four with tubes recurved, so as to present the openings of the funnels in four vertical planes, directed to four quarters of the horizon —*h* is the horizontal funnel, *v v v* three of the four vertical openings, and *c c c* three corresponding cocks for letting off the water into a graduated tube. The rain which falls into the funnels being carefully measured *after each shower*, the observer is able immediately to determine the direction and inclination of the rain. Observations with this instrument have been made satisfactorily for some months, and the author has found the angle of inclination of descending rain to vary from 0 to 6°, 13°, 17°, and in one case to 35°, without perceiving that these very unequal inclinations had any sensible effect on the relation of the quantities of rain received in the gauges which are placed at different elevations.—*Abridged from the Athenæum*, No. 676.



HEAT OF THE WEATHER.

M. Breguet, jun., has presented to the Academy of Sciences, at Paris, an ingenious apparatus for registering the Heat of the Weather at all hours of the day. An axis made to communicate with a metallic thermometer, and acting on a needle, causes the latter, by a circular movement, to indicate variations of temperature corresponding to a graduated scale; and by an ingenious contrivance, the needle is stopped from making any further indication at the end of each hour, and a fresh paper presented to it; so that, at the termination of each hour, it writes down the exact temperature of the atmosphere at that particular moment.—*Literary Gazette*, No. 1226.

FLUCTUATIONS OF THE BAROMETER AND THERMOMETER.

Year 1836, Feb. 29, 28.660; 1837, Nov. 1, 28.790; 1838, Feb. 9, 28.627; 1839, Nov. 10, 29.036; 1840, Nov. 13, 28519. On Thursday, Nov. 12, the Barometer stood at three o'clock, P.M. at 29.458; and on Friday, at three o'clock, P.M., at 28.535; and at five o'clock, P.M., 28,519; making a fall, in 26 hours, of 0·939. Above are the lowest points at which the Barometer has been in the last five years.—*Times*, Nov. 16.

On December 24, at 6, P.M., in London, the Thermometer stood at 26°, by midnight it had sunk to 21°, and towards morning it became still lower. At 6, A.M., Dec. 25, it had, however, risen to 26°: at noon, it fell to 21°; and at 6, P.M., to 18°, or 14° below freezing point.

METEOROLOGICAL SUMMARY FOR 1840.

(Communicated by DR. ARMSTRONG, *South Lambeth.)*

Months.	Temperature. Fahrenheit. Max.	Min.	Mean. Reaumur.	Centigrade.	De Lisle.	Atmospheric Variation. Mean Pressure in inches.	Prevailing Currents.	Solar Variation.	Hygrometer. Mean.	Rain in inches.	Modifications of Cloud. Cirrus.	Cirro-stratus.	Cumulus.	Cirro-cumulus.	Cumulo-stratus.	Nimbus.	Stratus.
Jan.	54	15	1·25	1·5	148	29·825	E. SW.	9·43	37·0	2·55	*	*	:	:	:	*	
Feb.	50	20	1·5	1·75	147	29·72	SW. NE. E.	8·42	34·2	1·46	:	*	:	:	:	*	
March ..	55	25	3·75	4·5	143	30·48	NE. NW. S.	10·36	38·9	0·217	:	*	:	:	:	:	
April ..	80	29	10·00	12·25	131	30·188	NE. SW.	23·32	43·3	0·125	:	*	:	:	:	*	
May	74	37	10·25	13·00	130	30·175	E. SW. W.	17·25	46·0	2·005	*	*	*	:	*	*	
June....	90	44	15·5	20·00	120	29·87	NW. SW.	17·87	50·0	1·380	*	*	:	:	*	*	
July	79	44	13·00	16·25	125	29·99	E. W.	16·20	54·0	1·700	:	*	*	:	:	*	
Aug.....	85	47	15·25	19·5	121	29·86	NE. SW.	18·18	54·7	1·030		*	:	:	*	*	
Sept....	75	34	10·00	12·25	131	29·55	W. SW.	15·05	52·0	2·501	:	*	*	:	*	*	
Oct.	67	32	8·00	10·00	135	30·11	NW. SE.	14·60	43·9	1·40		*	:	:	:	:	:
Nov.....	57	27	0·00	0 00	150	29·97	SW. NE.	11·15	40·5	2·725	:	*	:	:	:	*	
Dec.	55	18	1·00	1·25	148	30·165	SW. W. NE.	8·25	37·0	0·415		*	:	:	:		

Number of Days for the greater part rainy ..... 37 | Number of Days fair throughout, but more or less cloudy 240
" " fair ..... 67 | " cloudless throughout 12

Large Solar Halo on April 20. Asteroids on February 4, 27. Fire-ball, February 28.——High Wind from January 18 to 27 February, 33; from March 1 to 4; May 25; July 3, 4, 5, 6; August 17, 18; September 15, 16, 17, 28, 29; October 19; November 1, 14, 16, (disastrous on 13, 17.)——Highest Tides on January 6, 20, 21, 22; February 4, 5, 8, 18; April 8, 9, 10; August 19, 30; September 1, 9, 10, 14, 15, 16; October 14, 15; November 10, 11, 24; December 10, 11.——Thunder and Lightning on May 15, 17. This year has been somewhat remarkable for the infrequency of Thunder and Lightning within the horizon of the Metropolis.——Snow on February 19, 20; March 24; December 16, 17.——The Barometer, on December 26, 27, was at 30·97—so great a pressure has not been indicated within the last twenty years.——There has not been, since the beginning of the present century, so fine a month of April as the last.

In the Tabular Section, under " Modifications of Cloud," the asterisks signify the prevailing cloud of the month, and the colons the cloud of rarest appearance.
The variations of temperature and of atmospheric pressure are registered from instruments constructed by Ronketti, Museum Street. The means are ascertained from a comparative scale, graduated by the same maker.

Geographical Discovery.

THE NORTH-WEST PASSAGE.

INTELLIGENCE has reached the Hudson's Bay House, that Messrs. Dease and Simpson have, at last, been successful in ascertaining the existence of a North-west Passage. These gentlemen have solved the great problem, by supplying the link which was wanting to connect the discoveries of Parry and Ross from the east, with those of Beechey and Franklin from the west. The following is the principal Narrative of the Expedition, which is dated "Fort Simpson, Oct. 16, 1839." The explorers report the completion of all the primary objects of the Expedition; but, as they stated last winter, (1838,) it was quite out of the question to think of reaching the Strait of the Fury and Hecla from the Copper-mine river.

On the 22nd of June, they descended the impetuous stream of the Bloody Fall, where they remained until the 28th. This interval was employed by Mr. Simpson in exploring Richardson's river, discovered in 1838, which discharges itself, as was then supposed, into the bottom of Black's Inlet, in lat. 67. 53. 57. north, longitude 115. 56. west. Here was seen a party of about thirty Esquimaux encamped, all of whom fled precipitately to the hills, except one family, whose tent was placed on an island in this stream; but they had no information to impart of any value.

On the 3rd of July, the first slight opening occurred in the service, of which the explorers took instant advantage; but their first week's journey did not exceed twenty miles, and it was the 18th, after sad work, before they could attain Cape Barrow. From its rocky heights they beheld, with equal surprise and delight, the wide extent of Coronation Gulf, partially open; whereas, long after the same date, in 1838, the whole party might have crossed it on foot. At midnight, on the 20th, they landed at Cape Franklin, just one month earlier than Mr. Simpson's arrival there, on his pedestrian journey of the year before. A violent easterly gale arrested their progress for the next four days; and on the 27th they encountered great peril in doubling Cape Alexander, amidst very heavy driving ice.

From Cape Alexander, situated in lat. 61. 56. N., long. 106. 40. W., to another remarkable point in lat. 68. 33. N., long. 98. 10. W., the Arctic coast may be comprised in one spacious bay, stretching as far south as lat. 67. 40., before it turns off abruptly northward to the last-mentioned position. This vast sweep, of which but an inconsiderable portion was seen by Mr. Simpson in 1838, is indented by an endless succession of minor bays, separated from one another by long, narrow, projecting points of land, enclosing an incalculable number of islands.

White Bear Point, as it was called, lies in 68. 7. 8. N., 103. 36. 45. W.; variation 54. 45. E. These bays and masses of islands present a distinct succession of geological features. Vestiges of Esquimaux, and mostly old, were met with. They appear to subsist in single fami-

narrow bay, on the west side of Point Ogle, which extends to the parallel of latitude. The north wind blew roughly, with sharp frost; and next day they got no farther than Point Richardson. From thence they crossed over, on the 24th, to what had, from the Continent, appeared like two islands, but which was rightly conjectured to form part of the southern shore of Boothia, or, to speak with greater precision, of that land on which stands Cape Felix of Captain James Ross. This shore was traced for about sixty miles, till it turned up to the north, in lat. 68. 41. 16. N., long. 98. 22. W., only fifty-seven miles from Ross' Pillow; the dip of the needle was 89. 28. 45. N., the magnetic pole bearing N. N. E., distant ninety miles. The variation, as shewn by both the azimuth compass and the horizontal bar needle, was 45 degrees east. The objects seen on this coast were a low, uninteresting, limestone tract, abounding, nevertheless, in rein-deer, musk oxen, and old native encampments. To the westward a good deal of ice appeared, and vast numbers of snow-geese.

Recrossing the Strait, on the 25th, the party resumed, for some time, their outward route, only keeping more along the seaward verge of the islands, so as to shape a straighter course. The weather soon became unequivocally severe.

On the 29th of August, a severe snow-storm began, that lasted for seven days, during four of which the voyagers were fixed to a single spot by the violence of the north-west gales. At length, they quitted the Continent again, at the large river already mentioned, and struck N.N.W. for an extensive island, twenty-two miles off, which was coasted (N.W.) for twenty miles; and, shortly before sunset, on the 6th of September, they stood out from thence, due north, for the nearest point of Victoria Land, which coast was explored for upwards of 150 miles, and proved to be incomparably the boldest met with in these seas. Often, near the shore, no bottom could be found within thirty-five fathoms of line. There are several noble bays, the largest of which, north-west of Cape Alexander, is twenty miles wide, and equally deep, backed by snow-clad mountains. It attains to 69 degrees 40 minutes north, the highest latitude of this voyage. At length, was reached the extreme point seen by Mr. Simpson from Cape Franklin, in 1838, where the coast of this large country begins again to bend northward of west, Cape Barron Wing, by computation S.S.W., distant fifty miles. On the 10th of September, the party crossed this magnificent Strait.

The return from Cape Barron was miserably retarded by furious north-west winds and severe stress of weather. Winter permanently set in on the 15th of September; and, next day, the whole party joyfully re-entered the Coppermine River, after by far the longest voyage ever performed in boats on the Polar Sea. Leaving a small craft, remains of pemican, &c., as a prize for the first Esquimaux who may visit the Bloody Fall, the party ascended the river with double crew in four days; they abandoned our tents, and every thing but absolute necessaries; crossed the barren ground, up to the knees in snow, having unluckily left their snow-shoes on the coast; and safely reached

St. Confidence, at dusk, on the 24th. The fisheries had failed worse than ever, and they congratulated themselves on not being doomed to pass a third winter within the arctic circle.

After settling with the Indians, the explorers departed on the 26th, to go into inland batteaus — one belonging to the expedition, the other came from Fort Simpson sixteen days before their arrival.

The passage of Great Bear Lake was very severe. In crossing the body of the lake, and other considerable traverses, the boats, with everything in them, and even the very clothes on the voyagers' backs, became converted into concretions of ice. The temperature, which was at 4 degrees below zero when the party landed at the head of the river, on October 4, fell 10 degrees below it in the course of the night; and next day they descended the rapid stream in the very midst of the driving ice. On entering the Mackenzie, this excessive cold abated. On October 14, after forcing their way through the torrent of ice poured out by the river of the mountains, the party reached Fort Simpson, and were cordially welcomed by Chief Trader M'Pherson, who had, for some time, given up all hopes of their arrival.

So early and rigorous a commencement of winter in Mackenzie's River had not been heard off; and so fine a spring as 1839, seldom visits these frozen regions; whilst, to this favouring circumstance, under Providence, ought this signal success to be partially ascribed.

The explorers rejoice in having anticipated the Russian Expedition, and secured to their country and the Company the indisputable honour of discovering the North-West Passage, which has been an object of search to all maritime nations for three centuries.

Nothing remains to fill up the blank in the Geography of Northern America but the survey of the Gulf of Boothia, which Sir George Back failed to accomplish. The circuit of this Gulf to the Strait of the Fury and Hecla, according to the Esquimaux accounts, cannot be less than 400 or 500 miles.

It is stated that the Hudson's Bay Company commissioned Mr. Simpson to execute the above Survey; but this desirable consummation has been delayed by the suicide of Mr. Simpson, under very extraordinary circumstances. The two discoverers having disagreed, parted company: Mr. Simpson, and his companions, struck across from Lake Winnepeck for St. Peter's, intending to push into New York, *viâ* the Lakes, and thence sail for Liverpool. Mr. Dease, with another party, set out for the Canadas. About July 20, Mr. Simpson and his party reached Turtle River, and having encamped there, in a fit of derangement, Mr. S. shot one of his companions through the heart, seriously wounded another, and then shot himself in his own tent. The remainder of the party arrived at St. Peter's about July 1, in possession of the important papers and other property belonging to the ill-fated Simpson.

THE ANTARCTIC REGIONS.

Captain D'Urville has published a *précis* of his Second Attempt to reach the South Pole, in the *Astrolable* and *Zélée*; reporting the

discovery of a tract of land, which he has named *Terre Adélie*. The part observed, about 150 miles in extent, is comprised between 66° and 67° of south lat. and 136° and 142° of east long. Its mean height is about 1,300 feet above the horizon. The snow and the ice which covered it, almost gave its surface a level appearance. Little beyond this was observable but ravens, inlets, and projections, without a single trace of vegetation. Along the coast were whales, porpoises of considerable size, fur seals, and a few penguins, petrels, and albatrosses. These are all that the animal kingdom seems to offer. Capt. D'Urville is of opinion that the newly-discovered territory is of some extent. The fields of ice put a stop to all further progress westward, from the obstructions they presented; but between the east and south-east it did not appear impossible to penetrate to some distance, at least as far as the eye could reach from the mast-head. Contrary winds, fresh breezes from the east, and a desire entertained by Capt. D'Urville of affording satisfactory data for the determination of the magnetic pole, are the motives which hindered him from attempting any further search towards the E.S.E., and he sincerely trusts that other navigators may prosecute those discoveries already commenced. Captain D'Urville has likewise addressed to the French Minister of Marine, a more full detail of the Expedition, which document will be found translated in No. 662 of the *Athenæum*.

It is singular that, on the same day, the land seen by D'Urville was also seen by the American Expedition; the two parties being several hundred miles distant from each other. The account of the latter Expedition states:—By reference to the map, it will be seen the above discoveries are in the longitude of New South Wales, and a continuation most probably of the same continent; for a series of large islands was discovered, in 1830, by Mr. John Briscoe, of the navy, who, when commanding the brig *Tula*, on a sealing voyage, fell in with the land in lat. sixty-seven, long. fifty degrees, (that of the Mauritius,) and coasted it for 300 miles. He was also driven off by severe weather and icebergs.—*Sydney Herald*.

The public-spirited Mr. Enderby, in June last, fitted out another Expedition for the exploration of the Antarctic regions, under the command of Captain Mapleton, a fellow-voyager with Captain Ross. This expedition will not entail any expense on the English Government, but will be altogether an individual enterprise; whilst it seeks to carry forth all the views which Government entertained when Captain Ross was sent. France and the United States have recently sent ships of discovery to the southern latitudes. Captain D'Urville has succeeded only, as reported above. Meanwhile, the race for discovery is strong; and should our single-handed Expedition outstrip the Government efforts of two rival nations, the success will add lustre to the high reputation of the British merchant.

Obituary

OF PERSONS EMINENT IN SCIENCE OR ART.

1840.

M. LEREBOURS, the optician, of Paris.

UTZSCHNEIDER, who, together with Fraunhöfer, was the founder of the optical institution at Monaco, in Bavaria.

PROFESSOR VIVIANI, naturalist and mineralogist, of Geneva.

WILLIAM HENRY MAT. OLBERS, the astronomer, of Bremen.

M. ESPERCIEUX, sculptor, of Paris.

JOHN BATE, inventor of the *Anaglyptograph*, an instrument for tracing and representing upon plane surfaces a perfect resemblance of models in relief.

ALEXANDER NASMYTH, father of the fine arts in Scotland.

WILLIAM PITTS, sculptor.

BARON POISSON, mathematician, President of the Academy of Sciences, at Paris.

J. DESJARDINS, founder of the Mauritius Natural History Society.

THE REV. ALEXANDER CROMBIE, LL.D., F.R.S., metaphysician.

— HASELDINE, the engineer of the Menai and Conway Suspension Bridges.

JOHN ROBERTS, improver of the Safety Lamp.

PROFESSOR CHARLES BONNYCASTLE, of the University of Charlottesville, Virginia, United States.

DR. LUM QUA, the linguist, who assisted Dr. Marnham in his translation of the New Testament into Chinese.

The ABBÉ SCARPELLINI, Director of the Pontifical Observatory, Prof. of Astronomy, and Secretary of the Academia del Linnæi, at Rome.

JAMES CLELAND, LL.D., the statistician, of Glasgow.

LUKE CLENNELL, one of the most distinguished of Bewick's pupils, as a designer and painter, as well as engraver on wood.

SIR JEFFRY WYATVILLE, R.A., F.R.S., F.S.A., whose elaborate renovation of Windsor Castle entitles him to rank as one of the most successful architects of his time.

THOMAS LEYBOURN, F.R.S., and Senior Professor of Mathematics, of the Royal Military College, Sandhurst.

The Rev. ROWLAND BOND, author of some geographical and mathematical works.

THOMAS DANIELL, R.A., F.R.S. A.S., painter.

WILLIAM WARD, mezzotinto engraver.

JOHN FROST, founder of the Medico-Botanical Society of London.

THOMAS DRUMMOND, F.R.S., the conductor of the Ordnance Survey of Ireland, and the discoverer of the oxyhydrogen and lime light, which bears his name.

SIR RICHARD PHILLIPS, author of several works in educational science; and Essays on Natural Philosophy.

Sir Robert Seppings, F.R.S., Naval Architect, and Surveyor of the Navy for nearly 50 years.

James Prinsep, F.R.S., Secretary to the Asiatic Society of Bengal.

Dr. John Crampton, Professor of Materia Medica, King's and Queen's College of Physicians, Dublin.

Lucien Buonaparte, Prince of Canino; ornithologist.

Thomas Stedman Whitwell, civil-engineer; Editor of the *Mayazine of Popular Science.*

John Rickman, author of the Prefaces and Arrangements of the Population Abstracts and Returns, 1831; the *Life of Telford*, &c.

Professor Carl Ottfried Müller, (history and archæology), of Göttingen.

Nicholas Aylmer Vigors, F.R.S., one of the founders and the first Secretary of the Zoological Society.

P. B. Lord, M.D., author of *Outlines of Popular Physiology.*

Francis Bauer, botanical painter to the Royal Gardens at Kew; and who, by aid of the microscope, has made discoveries of great importance to agriculture. (See Memoirs, *Athenæum*, No. 687).

The Vicomte de Viart, author of a work on the Theory of Art, of considerable reputation.—*Athenæum*, No. 641.

M. Richerand, physician, of Paris; author of the *Nouveau Elémens de Physiologie.*

Mr. Oldham, engineer to the Bank of England, formerly to the Bank of Ireland, and the well-known inventor of the mechanical method for checking the number of notes printed, and preventing forgery.—*Athenæum*, No. 645.

M. Vandael, flower-painter, of Paris.

Chevalier Gasse, architect to the king of Naples.

M. Robiquet, the successor of Chaptal, in the Academy of Sciences, at Paris.—M. Turpin, also a distinguished chemist, and member of the French Academy.

Mr. Maclure, President of the Academy of Sciences, at Philadelphia.

M. Hugot, Professor of Architecture, at the Academy of Fine Arts, at Paris; one of his latest works was the *Arc de Triomphe.*

Mr. Simpson, the Arctic explorer. (*See page* 279.)

The Marquis de Pastorel, one of the oldest members of the French Institute.

Herr Heffer, the German botanical traveller, who was murdered by the natives in the Andaman Islands.

Sir Anthony Carlisle, F.R.S., many years Professor of Anatomy at the Royal Academy.

Von Littrow, Director of the Observatory, and Professor of Astronomy, at the University of Vienna.

Dr. Michael Ryan, author of several medical works.

Pierre Jos. Redouté, botanist and artist.

Charles George Meinecke, (Berlin), architect.

*** Professor Blumenbach died on January 22, 1840; and not in 1839, as stated in the Obituary, *Year-Book of Facts*, 1840.

GENERAL INDEX.

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